TETRA TECH

February 18, 2016

Mr. Ronald I. Rosen, Chair
Zoning Board of Appeals
100 Maple Avenue
Shrewsbury, MA 01545

Re: The Pointe at Hills Farm 40B Project
Traffic Peer Review Response

Dear Mr. Rosen:

Tetra Tech, Inc. (TT) is in receipt of the Traffic Engineering Peer Review of the Traffic Impact and Access Study for the proposed project at 440 Hartford Turnpike (Phase I) and 526 Hartford Turnpike (Phase II) in Shrewsbury. The peer review letter, dated January 22, 2016, was prepared by Ms. Jennifer Conley, P.E. PTOE of Conley Associates on behalf of the Shrewsbury Zoning Board of Appeals.

A copy of the original Conley letter, with comments that require a response highlighted and numbered, is included as Appendix A. This letter provides a brief summary of each Conley Associates comment and TT's response to that comment. Please refer to Appendix A for the full comment.

Comment 1: Conley Associates, Inc. reviewed the MassDOT crash data and found 38 total crashes over the five year period where the TIAS reported 32 total crashes. As indicated above, Conley Associates, Inc. found additional crashes associated with this portion of Route 20 that were not included in the TIAS. Even with the addition of those crashes, the crash rates would be below the District 3 average.

Response: Specific information related to the six additional crashes found by Conley Associates was not provided, so we were not able to confirm that they occurred within the study area and during the five year study period. However, as indicated in the comment, even with the addition of those crashes, the crash rates for the Route 20/Stoney Hill Road intersections and Route 20 would remain below the District 3 average.

Comment 2: The Intersection Crash Rate Worksheets are provided in the Appendix twice. The first set included the correct number of crashes and years of data and the second set included an incorrect number of crashes and years of data. The crash rate results in Table 13 reflect the correct crash rates where the correct number of crashes, years, and volumes were entered. It is likely that the later Intersection Crash Rate Worksheets were wrongfully included in the Appendix.

Response: We apologize for including old information in the Appendix. The crash data was reviewed and updated from a four year period to a five year period during the preparation of the traffic study and only the updated data should have been included in the appendix. Conley Associates is correct that the Table 13 reflects the most recent crash data and that data is correctly included in the Appendix.

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Comment 3: The TIAS reviewed the available sight lines at the proposed driveways. Using the site plan, the TIAS calculated the stopping sight distances (SSD) and intersection sight distances (ISD) available at the proposed locations. Conley Associates, Inc. reviewed the data provided and concurs that the SSD is met for the site driveway locations. As outlined in the TIAS, the ISD is not met at the Phase I Site Driveway at Stoney Hill Road and will only be met at the Phase II Site Driveway at Stoney Hill Road with removal of vegetation. Although it is desirable to meet the ISD minimums, Conley Associates, Inc. concurs with the TIAS that the SSD minimums are the safety thresholds of more importance.

Response: The intersection sight distance at both Stoney Hill Road site driveways either meets or exceeds the desirable threshold or exceeds the minimum threshold.

Comment 4: Of particular interest is the provision of the left turn lane into Stoney Hill Road (west). The provision of this left turn lane will provide a safer location for vehicles to queue while waiting to turn left into Stoney Hill Road (west). The design will provide for a deceleration lane into the site from Route 20, but tightens up the width and radii at the Stoney Hill Road (west) intersection effectively eliminating the existing area used for deceleration at that location. While it appears that the design at Stoney Hill Road (west) is consistent with MassDOT standards, it does present a change from the current operation.

Response: The Route 20/Stoney Hill Road (West) concept plan has been modified to include a deceleration area on Route 20 eastbound that is similar to the one that presently exists. During the December 28th hearing, a second issue was raised related to the concept plan. It was suggested that it may be challenging for a motorist on the Stoney Hill Road (West) approach to decide if a vehicle approaching Stoney Hill Road (West) from Route 20 eastbound, with the vehicle's right turn signal on, was about to turn onto Stoney Hill Road or shift into the deceleration lane provided for the Phase I Route 20 site driveway. That concern was remedied by reducing the length of the site drive deceleration lane.

These modifications to the original concept presented on Figure 12 in the traffic study are shown on Figure 1 attached to this memorandum.

Comment 5: The TIAS outlines a Transportation Monitoring Program to determine if the trip generation of the proposed site is consistent with what was estimated in the TIAS at milestones upon project completion. This data will be helpful to the Town by providing additional information as to whether trip generation for apartment complexes in Shrewsbury are consistent with ITE estimates. However, the Town will need to work with Counsel to determine an appropriate condition in the event that the signalization of Stoney Hill Road (west) is conditioned on the results of the monitoring.

Response: A meeting was held on February 2, 2016 at the MassDOT District 3 offices to again discuss the potential for a traffic signal at Stoney Hill Road. It was suggested at the meeting that the steep grade along Route 20 and the presence of the auxiliary climbing lane present a significant safety hazard when combined with a traffic signal at the Route 20/Stoney Hill Road (West) intersection.

We suggest that if the trip generation of the project exceeds by 10 percent the trip estimates for the project, a onetime $5,000 contribution will be made to the Town of Shrewsbury to be used towards traffic improvements or pedestrian accommodations in the area.

Comment 6: Conley Associates, Inc. would like the applicant to comment on whether it is possible that with consolidation on the opposite side of Route 20 as well as having all Phase I traffic exiting via Stoney Hill Road (west) that a traffic signal becomes a more palatable mitigation strategy to MassDOT.

Response: A traffic signal at the Route 20/Stoney Hill Road (West) intersection is not a viable option and no additional analysis will be provided to support a signal at that location.

Comment 7: The traffic volume data available may not provide all of the information needed. For example, the TIAS indicates that the existing Stoney Hill Road is generating traffic differently than is expected based on the industry standards. And the Stoney Hill Road data was used to distribute the new traffic from the proposed site over the course of the day. The Town may have traffic monitoring data from other apartments in Town that would provide another data point of residential distribution over the course of the day. In addition, during the public hearing it was made clear that some residents avoid the Stoney Hill Road (west) when possible. There may be some demand for that west intersection that is currently diverting to avoid difficult maneuvers. That traffic may divert back in the event that a traffic signal was provided at Stoney Hill Road (west).

Response: See response to Comment 6.

Comment 8: A neighbor did ask that the Stop signs and Stop lines be illustrated on the proposed plans for the roadway improvements on Route 20 and that the applicant's traffic engineer ensure that adequate sight lines will be available to and from the vehicle in that location. Conley Associates, Inc. concurs that that would be appropriate to include in the information provided to the Board.

Response: Figure 1 shows the sight lines for the proposed improvements at the Route 20/Stoney Hill Road (West) intersection. The sight lines are appropriate for a design speed of 55 mph.

Comment 9: Another concern raised by residents is the elimination of the informal deceleration area for vehicles turning right into Stoney Hill Road (west). The proposed design includes tightening the mouth of Stoney Hill Road including tighter turning radii. The neighbors expressed a concern that they will feel truck traffic barreling up behind them as they slow to turn into Stoney Hill Road (west). Based on the information provided, it is not clear if the applicant had investigated maintaining the wide shoulder and turning radii at this location.

Response: See response to Comment 4 and Figure 1.

Comment 10: During the public hearing, Conley Associates, Inc. was curious whether the property owner across the street had been contacted and coordinated with in regards to improvements at Route 20 and Stoney Hill Road (west). Has an eastbound left turn lane been considered at the Stoney Hill Road (west) intersection? The provision of this turn lane would provide protection for the traffic visiting that site regardless of whether a traffic signal is pursued at that location.

Response: A left turn lane for the Route 20 eastbound approach to Stoney Hill Road (West) and the Tri-State Trucking Driveway was not considered due to additional right-of-way impacts.

Comment 11: As presented, Conley Associates, Inc. has found that the TIAS follows the industry standard steps for completion of a traffic impact analysis. The remaining item of concern is in regards to the improvements proposed at Stoney Hill Road (west). Conley Associates, Inc. recommends

additional discussion with MassDOT and the other stakeholders (Town, property owner across the street) to determine if traffic signalization and other additional improvements should be implemented.

Response: Based on comments received at the hearing held on December 28, 2016 and correspondence received from residents, it is understood that a traffic signal to facilitate turns from Stoney Hill Road is strongly desired by both the ZBA and residents. However, as noted above, a traffic signal at the Route 20/Stoney Hill Road (West) intersection is not recommended or desirable due to the presence of the auxiliary climbing lane and the grades along Route 20 in that area. Additionally, traffic volumes at that location do not support installation of a traffic signal.

In an effort to be responsive to the concerns of the Zoning Board of Appeals and residents of Stoney Hill Road, an alternative which may allow installation of a traffic signal at the Stoney Hill Road (East) intersection was evaluated. The alternative entails prohibiting left turns to/from Stoney Hill Road (West). With this turn prohibition, both existing traffic and traffic generated by Phase I of the project would shift from Stoney Hill Road (West) to Stoney Hill Road (East), increasing traffic levels at the Route 20/Stoney Hill Road (East) intersection. With the additional traffic, the intersection meets the criteria for installation of a traffic signal.

The evaluation of a traffic signal the Route 20/Stoney Hill Road (East) intersection began with new traffic counts at both Stoney Hill Road intersections and included a traffic signal warrant analysis and intersection capacity analyses. The evaluation is summarized in the memorandum provided in Appendix B.

After completing the evaluation and developing concept level designs for both Route 20/Stoney Hill Road intersections, concept plans were presented to MassDOT District 3 on February 2, 2016. As the meeting was scheduled and planned within a short time period, town officials, although invited, indicated they were not available to attend. Throughout the month of February, the project proponent made several attempts to schedule a second MassDOT meeting with the town's Planning & Economic Development Department to present the concept plans. MassDOT indicated a willingness to attend a joint meeting with town officials and the proponent's development team. Unfortunately, the town did not provide dates for the meeting to occur.

At the meeting with MassDOT held on February 2nd, the concept plans included in the memorandum contained in Appendix B were presented. Although the comments received were generally positive, MassDOT suggested that sidewalks along Phase II site frontage and pedestrian accommodations at the traffic signal would be required. They also indicated that they would review the plan, and supporting information provided in the memorandum, and provide comments as appropriate. The concept plan was then modified to include the sidewalk and pedestrian accommodations at the traffic signal. This revised concept is shown on Figure 2.

The proposed geometric improvements at the Route 20/Stoney Hill Road (East) intersection include a 100 foot long exclusive left turn lane and shared through/right turn lane on the Route 20 westbound approach, and a through lane and 250 foot long auxiliary through lane on the Route 20 eastbound approach. The new lane configuration, including six foot wide shoulders and sidewalks on the south side of Route 20, will require minor widening along both sides of Route 20.

The traffic signal would include a four phased actuated traffic signal with a westbound protected left turn phase and exclusive pedestrian phase. It is expected that the traffic signal controller would be coordinated with the traffic signal controller at the Route 20/Centech Boulevard/Cherry Street intersection located approximately 1,900 feet east of Stoney Hill Road.

Figure 3 depicts the concept for the proposed modifications at the Route 20/Stoney Hill Road (West) intersection required to restrict the intersection to right in/right out turns and a new design for the Route

20/Phase I Site Driveway. The proposed geometry at Stoney Hill Road (West) was designed to allow Shrewsbury Fire apparatus to turn either left or right onto Stoney Hill Road. The modifications maintain the proposed sidewalk from Stoney Hill Road Plaza to the easterly end of the Phase I site. It is understood from MassDOT that the geometric turn restrictions at Stoney Hill Road (West) will be required in order to justify the traffic signal at Stoney Hill Road (East).

At the Phase I Route 20 site driveway, only a right turn from the driveway onto Route 20 will be allowed. Site traffic arriving from the west will turn right onto Stoney Hill Road and then left onto the proposed site driveway to access the Phase I site. A truck apron defined by sloped granite edging and scored concrete will allow Shrewsbury Fire apparatus to turn left into the site.

The truck turning analysis for both the Route 20/Stoney Hill Road (West) and Route 20/Phase I Site Driveway has been completed and is shown on the plan provided in Appendix C. As shown on the plan, a fire truck can access both Stoney Hill Road and the site driveway from either travel direction on Route 20.

Although MassDOT has provided positive comments on the revised access plan for Stoney Hill Road, the concept plan would of course be subject to a more comprehensive review by both MassDOT and Town of Shrewsbury officials as the permitting process continues.

In summary, there are currently two options for improved access to Stoney Hill Road for the Board to consider, including the modified plan of the Route 20/Stoney Hill Road (West) intersection shown on Figure 1 and the new access plan shown on Figures 2 and 3. Both options will be presented to the Zoning Board of Appeals at our next hearing which is expected to occur on February 29th. We are eager to receive feedback from both the Board and other attendees on both options.

Please do not hesitate to contact us should you need any further clarification or if you have any questions on the information presented in this letter.

Very truly yours,

Nancy B. Doherty

Nancy B. Doherty, PE
Senior Project Engineer

Appendixes:

Figures 1 - 3
Appendix A – Original Conley Associates Peer Review Letter
Appendix B – Route 20/Stoney Hill Road (East) Traffic Signal Memorandum
Appendix C – Truck Turning Analysis

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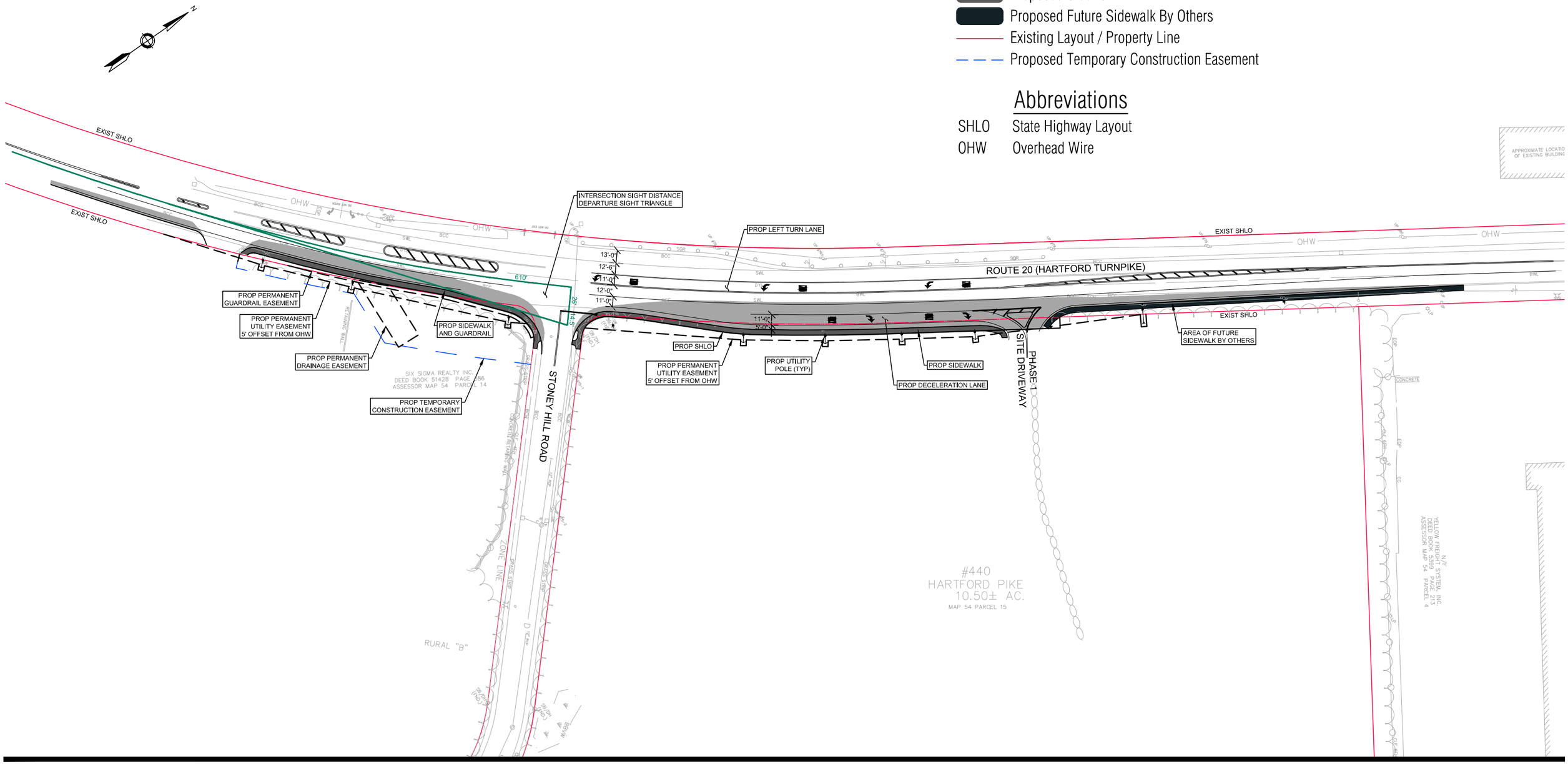
Legend

- Proposed Widening
- Proposed Sidewalk
- Proposed Future Sidewalk By Others
- Existing Layout / Property Line
- Proposed Temporary Construction Easement

Abbreviations

SHLO	State Highway Layout
OHW	Overhead Wire



Shrewsbury, Massachusetts

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Route 20 / Stoney Hill Road (West)
Conceptual Improvements Concept Plan

Figure 1

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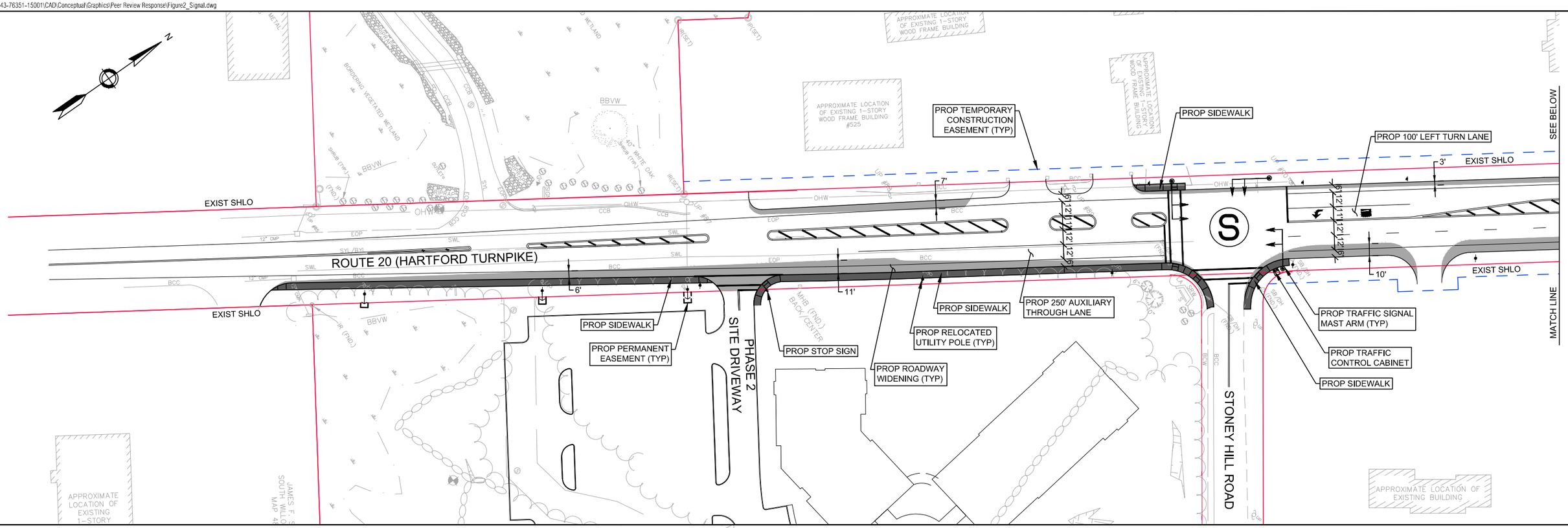

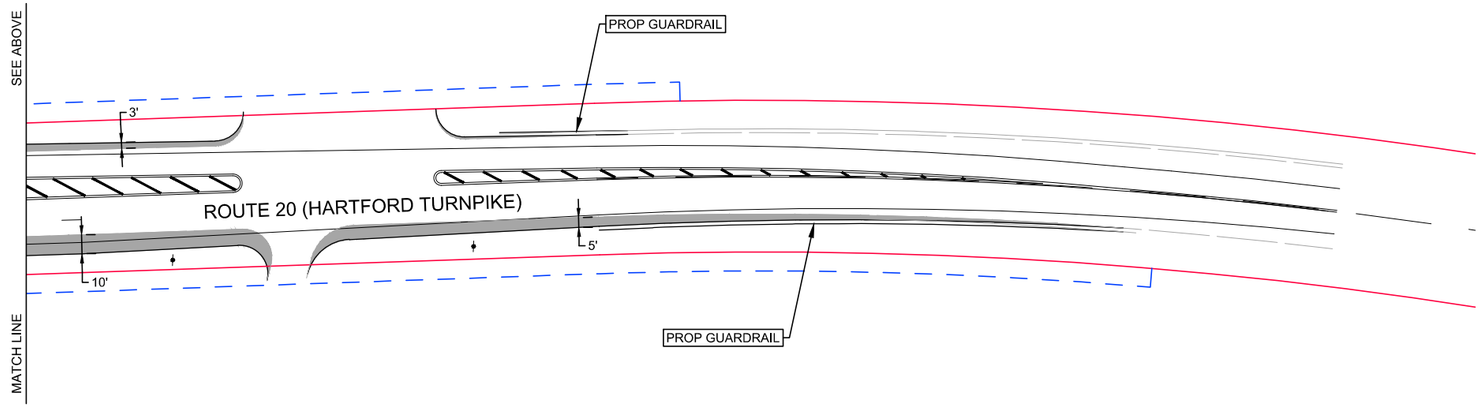

Legend

- Proposed Widening
- Proposed Sidewalk
- Existing Layout / Property Line
- Proposed Temporary Construction Easement

Abbreviations

SHLO	State Highway Layout

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0 40 100 200

Shrewsbury, Massachusetts

Route 20 / Stoney Hill Road (East)
Traffic Signal Concept Plan

Figure 2

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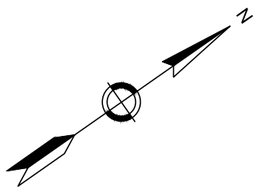

Legend

- Proposed Sidewalk
- Proposed Cement Concrete Island
- Proposed Stamped Concrete Truck Apron
- Existing Layout / Property Line
- Proposed Temporary Construction Easement

Abbreviations

SHLO	State Highway Layout
SL	Stop Line
SWGL	Solid White Gore Line
SYEL	Solid Yellow End Line

IDENTIFICATION NUMBER	SIZE OF SIGN (INCHES)		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND (NUMBER REQUIRED)	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
H1-2	24	24		SEE MASS DOT STANDARD			-	SEE MASS DOT STANDARD			EACH	EACH	EACH
R1-1	30	30		SEE 2009 MUTCD			-	SEE 2009 MUTCD			–	6.25	--
R3-2	36	36		SEE 2009 MUTCD			-	SEE 2009 MUTCD			–	9.00	--
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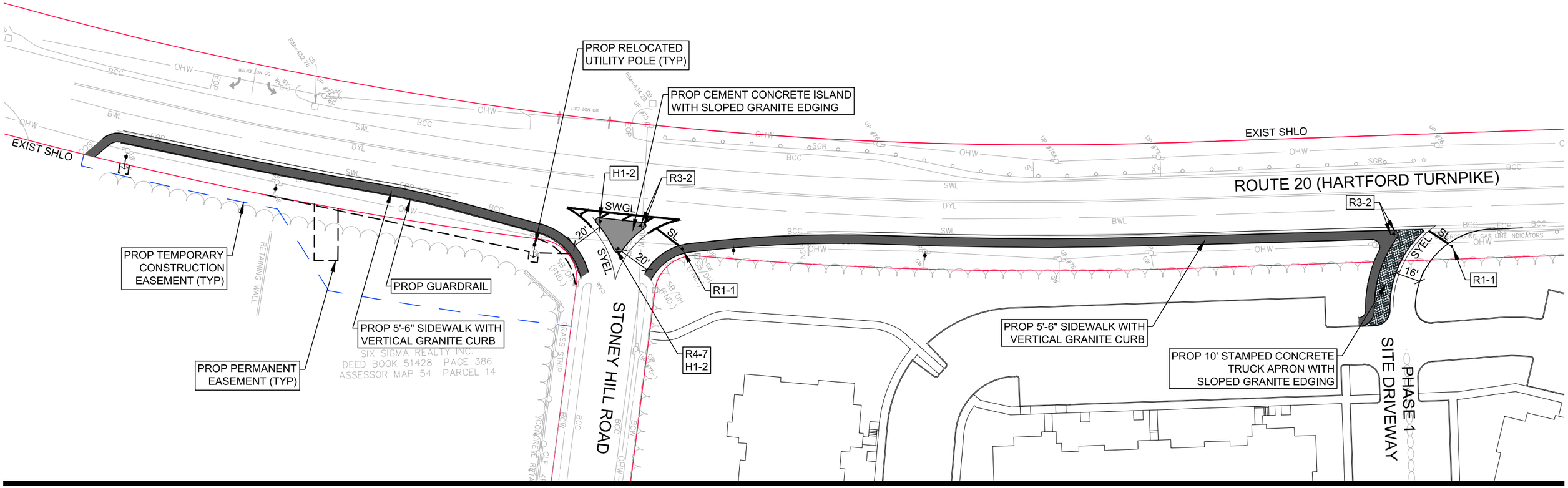

Shrewsbury, Massachusetts

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Route 20 / Stoney Hill Road (West)
Right-In / Right-Out Concept Plan

Figure 3

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Appendix A

Conley Associates, Inc. Peer Review Memorandum

CONLEY ASSOCIATES

Memorandum

To: Shrewsbury Zoning Board of Appeals

From: Jennifer Conley, P.E., PTOE

Date: January 22, 2016

Re: Traffic Engineering Peer Review, The Pointe at Hills Farm, Shrewsbury, MA

Conley Associates, Inc. has been retained by the Town of Shrewsbury to review a Traffic Impact and Access Study (TIAS) associated with The Pointe at Hills Farm project. The TIAS was completed in November of 2015 by Tetra Tech. The TIAS analyzed the traffic impact of 180 apartment units to be located at 440 Hartford Turnpike (Phase I) and 100 apartment units to be located at 526 Hartford Turnpike (Phase II). The study area included the intersections of Route 20 at Stoney Hill Road (west) and Route 20 at Stoney Hill Road (east). Conley Associates, Inc. has completed the review, and the findings are presented below.

Existing Conditions

Conley Associates, Inc. reviewed the information contained in the Existing Conditions section of the TIAS. The existing conditions sections included: roadway descriptions, pedestrian and bicycle accommodations, public transit, existing traffic volume data, and a delay and queueing study for Stoney Hill Road.

The existing roadway conditions described in the TIAS were consistent with conditions observed in the field and presented in aerial photography. The geometry described in the TIAS was also consistent with the geometry used in the operational analysis included in the Appendix. The descriptions of the minimal pedestrian/bicycle accommodations and public transit were appropriate.

The TIAS correctly calculated seasonality for the traffic volume data. The MassDOT traffic volume data provided in the Appendix shows that November traffic volumes are higher than average month volumes as stated in the TIAS.

The TIAS determined an annual growth rate to adjust 2014 traffic volume to a 2015 Existing condition. Conley Associates, Inc. reviewed the MassDOT traffic volume data provided in the Appendix and found the 0.5 percent annual growth rate to be reasonable. The 2014 peak hour traffic volumes were correctly adjusted upwards to determine the 2015 Existing condition traffic volumes. The Existing weekday AM and weekday PM peak hour traffic volumes shown in Figure 6 were calculated correctly.

Traffic counts in the Appendix indicate one pedestrian or bicyclist passed through the study area intersections during the weekday PM traffic count. The truck traffic percentages outlined in the TIAS were consistent with the traffic counts provided in the Appendix.

The daily traffic volume data was calculated using an average of the two day traffic volumes collected on weekdays in April of 2014. Although Conley Associates, Inc. would typically take the higher daily traffic volume, the weekday daily traffic volume presented in the report is reasonable.

The TIAS included a delay and queue study conducted for each Stoney Hill Road intersection during the weekday AM and weekday PM peak hours. Table 1 presents the average delay, maximum delay, average queue, and maximum queue information for Stoney Hill Road (west) and Stoney Hill Road (east). The information presented in Table 1, Stoney Hill Road Delay Study was consistent with the information provided in the Appendix.

The average delay for vehicles exiting Stoney Hill Road was approximately 30 seconds or less during both peak hours. The maximum delay for vehicles exiting Stoney Hill Road occurred during the weekday AM peak hour and was 2.5 minutes. The average queue for a vehicle exiting Stoney Hill Road was one vehicle. The maximum queue on Stoney Hill Road was four vehicles which occurred during the weekday AM peak hour.

Future Conditions without the Project

The TIAS projected the 2015 Existing traffic volumes to a 2022 No Build condition. The seven year horizon for future conditions analysis is consistent with the new Transportation Impact Guidelines issued by MassDOT. The 2022 No Build traffic volumes were calculated using industry standards. The TIAS included the following projects as background developments: a convenience store/gas station at 604 Hartford Turnpike; Altec on Fortune Boulevard; garage buildings/mechanics at 360 Hartford Turnpike; and Boston Medical Products on Chestnut Street.

The methodology used to determine the 2022 No Build condition peak hour traffic volumes followed industry standards. The traffic associated with each of the background developments was correctly added to the 2022 peak hour traffic volumes. Conley Associates, Inc. verified that the 2022 No Build weekday AM and weekday PM peak hour traffic volumes shown in Figure 7 were accurately depicted.

Site Generated Traffic

The TIAS calculated trip generation for Phase I and Phase II of the proposed residential project following industry standards. Trip generation was based on the Institute of Transportation Engineer's (ITE) Trip Generation Manual, 9th Edition. Conley Associates, Inc. verified that the trip generation was calculated using ITE Land Use Code (LUC) 220 Apartment and followed the building program outlined in the TIAS. The trips associated with Phase I and Phase II of the project were correctly calculated and the information in Table 4, Project Trip Generation was consistent with the trip data provided in the Appendix.

Local trip generation rates were calculated based on the 2014 traffic counts and the number of single family homes using Stoney Hill Road as an access to Route 20. Conley Associates, Inc. reviewed existing aerial photography of Stoney Hill Road and concurred that the 180 single family home estimate in the neighborhood was reasonable. The local trip generation was

calculated correctly and compared to the appropriate ITE rate for single family homes. The local trip generation rates were lower than the ITE trip generation rates. Using the local data, the trip generation estimate for The Pointe at Hills Farm would have been lower.

The mode share information provided in Table 5 of the TIAS is consistent with the information found in the Appendix based on 2010 Census information from Transportation Planning Products. The existing mode splits in Shrewsbury are as follows: 89 percent single occupancy vehicle, 7 percent carpool, with the remaining 4 percent using transit/bicycle/walk/other. Conley Associates, Inc. believes it unlikely that there will be anything other than vehicle trips associated with the project. The TIAS does not take any credit for alternative methods of transportation, which is appropriate.

The TIAS calculated trip distribution using US Census Journey to Work data for Shrewsbury residents as well as local traffic patterns. Conley Associates, Inc. reviewed the gravity model provided in the Appendix and found the trip patterns to be reasonable. As outlined in the TIAS, the distribution based on the gravity model oriented 44 percent of the trips to and from points east of the site along Route 20 and 56 percent to and from points west of the site along Route 20. However, the TIAS did not base trip distribution on these patterns. The TIAS based trip distribution on the trip distribution of the existing Stoney Hill Road traffic counts.

Conley Associates, Inc. reviewed the trip patterns of existing neighborhood residents and found that the distribution used in the TIAS was reasonable. The trip distribution based on actual traffic patterns was correctly illustrated in Figure 8, Trip Distribution (Phase I) and Figure 9, Trip Distribution (Phase II). Conley Associates, Inc. verified that the project trips shown in Figure 10 were calculated correctly.

Future Conditions with the Project in Place

The trips associated with Phase I and Phase II of The Pointe at Hills Farm were added to the 2022 No Build condition peak hour traffic volumes to determine the 2022 Build condition peak hour traffic volumes. The 2022 Build weekday AM and weekday PM peak hour traffic volumes shown in Figure 11 were correctly calculated.

Table 7, Traffic Volume Comparison shows the increase in Route 20 traffic volumes between the 2022 No Build and 2022 Build condition peak hour traffic volumes. Based on the TIAS, the project will increase traffic volumes at the intersection of Route 20 at Stoney Hill Road (west) by approximately four percent during the weekday AM peak hour and by approximately seven percent during the weekday PM peak hour. This intense level of impact is felt at that intersection only. On either side of Stoney Hill Road (west), the impact to Route 20 will be three percent during the AM peak hour and five percent during the PM peak hour. A similar impact is expected at Stoney Hill Road (east). The 2022 No Build and 2022 Build condition traffic volume increases were consistent with figures provided in the report.

Traffic Operations Analysis

The capacity analysis procedures outlined and used in the TIAS follow industry standards. Conley Associates, Inc. conducted a review of the analysis sheets found in the Appendix. The report figures and the analysis summary sheets for each intersection were consistent for the 2015 Existing, 2022 No Build, and 2022 Build condition peak hour traffic volumes. In addition, the LOS and delay summary for the weekday AM peak hour (Table 10) and the weekday PM peak hour (Table 11) were correct based on the information provided in the Appendix.

The TIAS compared the field measured average delay to the average delay calculated by Synchro at the Route 20 at Stoney Hill Road intersections. Conley Associates, Inc. verified that the LOS and delay results shown in Table 12, Existing Stoney Hill Road Delays and LOS (Synchro Model vs. Actual), were consistent with the information provided in the Appendix.

Although not discussed in the TIAS, the field measured LOS and average delay results are significantly better than those calculated by the Synchro software for the existing conditions. The Synchro reports indicate that the Route 20 at Stoney Hill Road intersections are operating at LOS F during the weekday AM peak period. In fact, these intersections are operating at LOS D based on field measured delay. Similarly, Synchro reports LOS F at the Stoney Hill Road west intersection and LOS D at the Stoney Hill Road east intersection during the weekday PM peak hour. The field delay studies show that these intersections are operating at LOS B or better during the weekday PM peak hour. Although field delay studies showed the study area intersections to be operating better than calculated by Synchro, no credit was taken in the LOS results for the No Build and Build conditions analysis. Therefore, it is likely that the Route 20 at Stoney Hill Road intersections will experience better operations that those reported by Synchro in the 2022 No Build and 2022 Build conditions.

Crash History

Comments 1 and 2

The TIAS researched the crashes that have occurred at both intersections of Route 20 and Stoney Hill Road and presented data on the types of crashes and conditions in which those crashes occurred. Conley Associates, Inc. reviewed the MassDOT crash data and found 38 total crashes over the five year period where the TIAS reported 32 total crashes. In order to determine if these additional crashes would have significant impact on the crash rates, the worksheets provided in the TIAS were reviewed. The Intersection Crash Rate Worksheets are provided in the Appendix twice. The first set included the correct number of crashes and years of data and the second set included an incorrect number of crashes and years of data, however, the crash rate results in Table 13 in the TIAS do not reflect the incorrect crash rates found in the Appendix. The crash rate results in Table 13 reflect the correct crash rates where the correct number of crashes, years, and volumes were entered. It is likely that the later Intersection Crash Rate Worksheets were wrongfully included in the Appendix. As indicated above, Conley Associates, Inc. found additional crashes associated with this portion of Route 20 that were not included in the TIAS. Even with the addition of those crashes, the crash rates would be below the District 3 average.

Sight Distance Analysis

Comment 3

The TIAS reviewed the available sight lines at the proposed driveways. Using the site plan, the TIAS calculated the stopping sight distances (SSD) and intersection sight distances (ISD) available at the proposed locations. Conley Associates, Inc. reviewed the data provided and concurs that the SSD is met for the site driveway locations. As outlined in the TIAS, the ISD is not met at the Phase I Site Driveway at Stoney Hill Road and will only be met at the Phase II Site Driveway at Stoney Hill Road with removal of vegetation. Although it is desirable to meet the ISD minimums, Conley Associates, Inc. concurs with the TIAS that the SSD minimums are the safety thresholds of more importance.

Project Related Roadway Improvements

Comment 4

This TIAS outlines the proposed configuration and allowable movements at each of the site driveways. Conley Associates, Inc. reviewed Figure 20 in regards to the Phase I access points as well as the discussion in the text and found them to be consistent with the information presented during the public hearing. Of particular interest is the provision of the left turn lane into Stoney Hill Road (west). The provision of this left turn lane will provide a safer location for vehicles to queue while waiting to turn left into Stoney Hill Road (west). The design will provide for a deceleration lane into the site from Route 20, but tightens up the width and radii at the Stoney Hill Road (west) intersection effectively eliminating the existing area used for deceleration at that location. While it appears that the design at Stoney Hill Road (west) is consistent with MassDOT standards, it does present a change from the current operation.

Conley Associates, Inc. has reviewed the Phase II access plan. Based on the TIAS, a full access driveway is proposed on Route 20 and a full access driveway is proposed on Stoney Hill Road (east). No improvements are currently proposed in the vicinity of Phase II.

The TIAS investigated the signalization of Stoney Hill Road (west) by reviewing the existing traffic data over the course of a weekday (adjusted to 2015 Existing condition) and adding in project related traffic. The distribution over the course of the day for the Phase I trips was determined using the hourly distribution over the course of the day that was observed on Stoney Hill Road. This methodology follows sound engineering practice and indicates that the traffic volumes calculated will not meet the eight hour traffic signal warrants. Based on feedback received at the public hearing, Conley Associates, Inc. will comment further on this item later in this Memorandum.

Transportation Demand Management

Although the TIAS outlines a number of items that will be provided on site, it is unlikely that a significant amount of vehicular trips will be reduced at the site. The TIAS has not estimated any reduction in trips which is appropriate.

Transportation Monitoring Program

Comment 5

The TIAS outlines a Transportation Monitoring Program to determine if the trip generation of the proposed site is consistent with what was estimated in the TIAS at milestones upon project completion. This data will be helpful to the Town by providing additional information as to

whether trip generation for apartment complexes in Shrewsbury are consistent with ITE estimates. However, the Town will need to work with Counsel to determine an appropriate condition in the event that the signalization of Stoney Hill Road (west) is conditioned on the results of the monitoring.

Conley Associates, Inc. Comment on Neighbor Testimony

Conley Associates, Inc. attended the public hearing held on December 28, 2015. In addition to the presentation by the applicant's traffic engineer, a number of neighbors raised questions and concerns. Although it is the responsibility of the applicant's traffic engineer to answer the questions raised at the public hearing (and in writing), Conley Associates, Inc. has been asked to provide comment on the items of greatest concern to the neighbors.

A large number of the concerns regarded expanding the scope of study to include different intersections or roadway sections along Route 20. Conley Associates, Inc. found the focus of the study to be appropriate for this project. The impact of the project will be less significant at other locations.

Another issue raised in the email correspondence was when the data collection occurred and how many days should have been collected. Unless there is a particular date that is in question due to a holiday, snowstorm, major event or major incident, a single date of data collection is adequate. Traffic volumes do vary slightly day to day, however when traffic counts are adjusted to an average month they compare very well to follow up traffic counts taken at the same location and adjusted to an average month. The TIAS did include 24 hour traffic count data on Route 20 and on Stoney Hill Road.

The traveling speed of vehicles on Route 20 was a concern raised at the hearing. The TIAS included speed data collected on Route 20 that indicated that vehicles were traveling at 85th percentile speeds of 51 to 55 miles per hour depending on the day and direction. Because speed limits are typically set based on the 85th percentile speed of a roadway, no change would be recommended. The speed that drivers are comfortable traveling at is currently close to the posted speed limit.

The length of the crash data research was a concern raised by neighbors who may have been in crashes that occurred prior to that data collection. Crash data is typically reviewed for a three year period to avoid any particular year influencing the data with a spike or trough. The TIAS reviewed crash data for a five year period which is appropriate. Researching further back may reveal a crash or two that involved certain neighbors, but it is unlikely that the overall average crash rate would be influenced significantly unless the configuration has changed in a way that affected safety.

Questions were raised in regard to the choice to provide two access points to each phase of development. The applicant's traffic engineer indicated that MassDOT would prefer to limit access points on Route 20 and would rather have access to the sites provided via Stoney Hill Road. Although Conley Associates, Inc. has not met with MassDOT regarding this project at

this time, it is typical of MassDOT to practice access management on their state highways and limit access to existing local roadways wherever possible. It is not clear at this time if there are benefits to the applicant and the Town to pursuing additional access eliminations.

Comment 6 Conley Associates, Inc. would like the applicant to comment on whether it is possible that with consolidation on the opposite side of Route 20 as well as having all Phase I traffic exiting via Stoney Hill Road (west) that a traffic signal becomes a more palatable mitigation strategy to MassDOT.

The neighbors expressed their desire for a traffic light verbally at the meeting as well as afterward in email correspondence. The comment was made that people are currently taking a right to avoid taking a left out of Stoney Hill Road. As outlined by the Traffic Engineer at the meeting, the distribution does show that to be the case whereas the distribution Town-wide shows there would be more lefts.

There was a very detailed presentation prepared by a local resident on the topic of roadway improvements. The presentation provided the concerns of a vehicle attempting to pull out from each Stoney Hill Road intersection as well as from the new site driveways and then went on to recommend a traffic signal at Stoney Hill Road (west). The presentation listed other locations in Town that are either similar to the currently proposed condition or are similar to the condition with a traffic signal in place. Conley Associates, Inc. is not familiar with the traffic operations of Edgemere Boulevard and the conditions under which its traffic signal was installed, but the TIAS is correct that in most cases a traffic signal is not installed if an eight hour warrant is not met.

Comment 7 The traffic volume data available may not provide all of the information needed. For example, the TIAS indicates that the existing Stoney Hill Road is generating traffic differently than is expected based on the industry standards. And the Stoney Hill Road data was used to distribute the new traffic from the proposed site over the course of the day. The Town may have traffic monitoring data from other apartments in Town that would provide another data point of residential distribution over the course of the day. In addition, during the public hearing it was made clear that some residents avoid the Stoney Hill Road (west) when possible. There may be some demand for that west intersection that is currently diverting to avoid difficult maneuvers. That traffic may divert back in the event that a traffic signal was provided at Stoney Hill Road (west).

Comment 8 A neighbor did ask that the Stop signs and Stop lines be illustrated on the proposed plans for the roadway improvements on Route 20 and that the applicant's traffic engineer ensure that adequate sight lines will be available to and from the vehicle in that location. Conley Associates, Inc. concurs that that would be appropriate to include in the information provided to the Board.

Comment 9 Another concern raised by residents is the elimination of the informal deceleration area for vehicles turning right into Stoney Hill Road (west). The proposed design includes tightening the mouth of Stoney Hill Road including tighter turning radii. The neighbors expressed a concern that they will feel truck traffic barreling up behind them as they slow to turn into Stoney Hill

Road (west). Based on the information provided, it is not clear if the applicant had investigated maintaining the wide shoulder and turning radii at this location.

Comment 10

During the public hearing, Conley Associates, Inc. was curious whether the property owner across the street had been contacted and coordinated with in regards to improvements at Route 20 and Stoney Hill Road (west). Has an eastbound left turn lane been considered at the Stoney Hill Road (west) intersection? The provision of this turn lane would provide protection for the traffic visiting that site regardless of whether a traffic signal is pursued at that location.

Finally, the neighbor presentation indicated that it is quite likely that vehicles will turn left out when exiting the Phase I right in, right out driveway and cites an example in Town. Conley Associates, Inc. understands that this does occur at many locations and that enforcement is sometimes difficult. Based on the plans provided by the applicant, the site will be designed to discourage that movement. Based on the discussions at the hearing, a number of residents currently choose to turn right out of Stoney Hill Road even though they are allowed to turn left currently, only to avoid making that difficult maneuver.

Recommendations and Conclusions

Comment 11

As presented, Conley Associates, Inc. has found that the TIAS follows the industry standard steps for completion of a traffic impact analysis. The remaining item of concern is in regards to the improvements proposed at Stoney Hill Road (west). Conley Associates, Inc. recommends additional discussion with MassDOT and the other stakeholders (Town, property owner across the street) to determine if traffic signalization and other additional improvements should be implemented.

Appendix B

Route 20/Stoney Hill Road East Signal Memorandum

TETRA TECH

MEMO

To:	Fran Zarette Smart Growth Design, LLC
From:	Nancy B. Doherty, PE
Date:	February 1, 2016
Subject:	The Pointe at Hills Farm Route 20/Stoney Hill Road East Traffic Signal

In accordance with your request, Tetra Tech has conducted a study of the Hartford Turnpike (Route 20)/Stoney Hill Road (East) intersection in Shrewsbury, MA. The study addresses concerns expressed at the ZBA hearing, held on December 28, 2015, regarding the proposed Pointe at Hills Farm residential development. Specifically, issues related to the currently proposed improvements at the Stoney Hill Road westerly leg, concerns with making a left turn from either leg of Stoney Hill Road onto Route 20 and the desire for a traffic signal for the Stoney Hill Road neighborhood were raised by both local officials and residents for the intersection. A traffic signal at the Route 20/Stoney Hill Road (West) intersection is not desirable due to the presence of the auxiliary climbing lane and the slope of Route 20 in that area. Therefore, a traffic signal at the Route 20/Stoney Hill Road (East) intersection is being considered.

1.0 BACKGROUND

At the ZBA hearing many participants cited long delays and safety concerns related to making a left turn onto Route 20 from either Stoney Hill Road intersection. Specifically, it was suggested that the combination of high travel speeds (posted for 50 mph) and high volumes (1,900 vph during peak hours) on Route 20 make the left turn maneuver challenging, which results in residents making right turns instead, with alternative routing to proceed to destinations west or northwest. For instance, it was suggested that to access Route 20 westbound a right from Stoney Hill Road onto Route 20 eastbound is made and then to reverse direction a U-turn is made in one of the commercial driveways east of Stoney Hill Road. To access Route 140, residents turn right from Stoney Hill Road onto Route 20, left onto Cherry Street and then left onto Gold Street which intersects Route 140, north of Route 20. The proclivity of these alternative routes is supported by both existing turning movement counts and the gravity model, both conducted as part of the *Traffic Impact and Access Study* (Tetra Tech, November 2015) prepared for The Pointe at Hill Farms. From this data, it is estimated that during the morning peak hour approximately 29 percent of vehicles currently turning right are likely using one of these alternative routes. It is worth noting that the delays study performed for the traffic study indicate that the delays for all turning vehicles were not excessive and that the detailed safety analysis conducted for the study indicates that neither Stoney Hill Road intersection has a high crash rate.

The currently proposed access improvements at Stoney Hill Road (West) and the Phase I Route 20 site driveway were presented at the ZBA meeting. These improvements were previously vetted with MassDOT and town staff, and were determined to be appropriate and acceptable. The improvements include a new left turn lane on Route

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20 westbound at Stone Hill Road (West) and a deceleration lane for vehicles turning into the Phase I Route 20 site driveway.

Concerns raised by the residents related to the proposed design included the potential challenge for vehicles on the Stoney Hill Road (West) approach to decide if a vehicle approaching Stoney Hill Road (West) from Route 20 eastbound, with the vehicle's right turn signal on, was about to turn onto Stoney Hill Road or shift into the deceleration lane provided for the Phase I Route 20 site driveway. That concern could potentially be remedied by reducing the site drive deceleration lane. The lack of a proposed traffic signal control at either Route 20/Stoney Hill Road intersection was also of concern to the Zoning Board members and many residents.

In an effort to be responsive to the concerns of the Zoning Board and residents of Stoney Hill Road, an alternative which may allow installation of a traffic signal at the Stoney Hill Road (East) intersection was discussed by team members. The alternative entails prohibiting left turns to/from Stoney Hill Road (West). With this turn prohibition, traffic would shift from Stoney Hill Road (West) to Stoney Hill Road (East), increasing traffic levels at the Route 20/Stoney Hill Road (East) intersection and potentially resulting in the intersection meeting the criteria for installation of a traffic signal.

The potential to signalize the Route 20/Stoney Hill Road (East) intersection was evaluated and that evaluation is summarized in this memorandum. The evaluation included performance of traffic signal warrant analysis, intersection capacity analyses and development of conceptual designs at both Stoney Hill Road intersections.

2.0 TRAFFIC SIGNAL WARRANT ANALYSIS

MassDOT's criteria for implementation of a traffic signal is contained in the 2009 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration. The MUTCD describes nine warrants, each with a different set of criteria on which to justify the installation of a traffic signal. MassDOT specifically requires that the criteria of Warrant 1 – Eight-Hour Vehicular Volume be met as justification for a traffic signal on state highway. For the Route 20/Stoney Hill Road (East) intersection, the criteria is that for eight hours in one day (not necessarily contiguous), the total volume on Route 20 (both directions) must exceed 525 vehicles per hour, and for that same hour, the total volume on the Stoney Hill Road approach to Route 20 (northbound only) must exceed 53 vehicles per hour.

Table 1 provides a summary by hour of the traffic volumes for Route 20 and Stoney Hill Road. The volumes are based on the following:

- Traffic counts obtained on Thursday, January 7, 2015 at both Route 20/Stoney Hill Road intersection. The count data, obtained for a 13 hour period (6:00 a.m.to 7:00 p.m.), were increased by 5.5 percent to reflect average annual conditions.
- Left turns from Stoney Hill Road (West) will be prohibited. All left turns from Stoney Hill Road will occur at the easterly leg. For each hour, all vehicles turning left from Stoney Hill Road (West) were redistributed to Stoney Hill Road (East). The left turns shifted from the west leg to the east leg ranged from 5 to 25 vehicles an hour.
- Left turns from Route 20 onto Stoney Hill Road (West) will be prohibited. All left turns onto Stoney Hill Road will occur at the easterly leg. For each hour, all vehicles turning left from Route 20 westbound onto Stoney Hill Road (West) were redistributed to Stoney Hill Road (East). The left turns shifted ranged from 0 to 10 vehicles an hour.
- For the morning hours (6:00 a.m. to 12:00 p.m.), a portion of Stoney Hill Road (West) right turn volumes were redistribute to Stoney Hill Road (East). Approximately 25 percent of vehicles turning right from Stoney Hill Road (West) were redistributed to the Stoney Hill Road (East) representing one to five

vehicles an hour. These are motorists which currently turn right to avoid a left turn from Stoney Hill Road. It is assumed that with a traffic signal at Stoney Hill Road (East), these motorists would instead shift to Stoney Hill Road (East) to turn left onto Route 20.

- Project trips are based on the trip generation included in the traffic study.
- The distribution of project trips is based on data provided in the traffic study, but adjusted to reflect the turn restrictions at the Route 20/Stoney Hill Road (West) intersection. For the morning hours, adjustments were also made to reflect a lower percentage of vehicles proceeding east (turning right) and a higher percentage of vehicles proceeding west (turning left). The revised distributions are shown on Figures 1 and 2 for Phase I and Phase II, respectively.

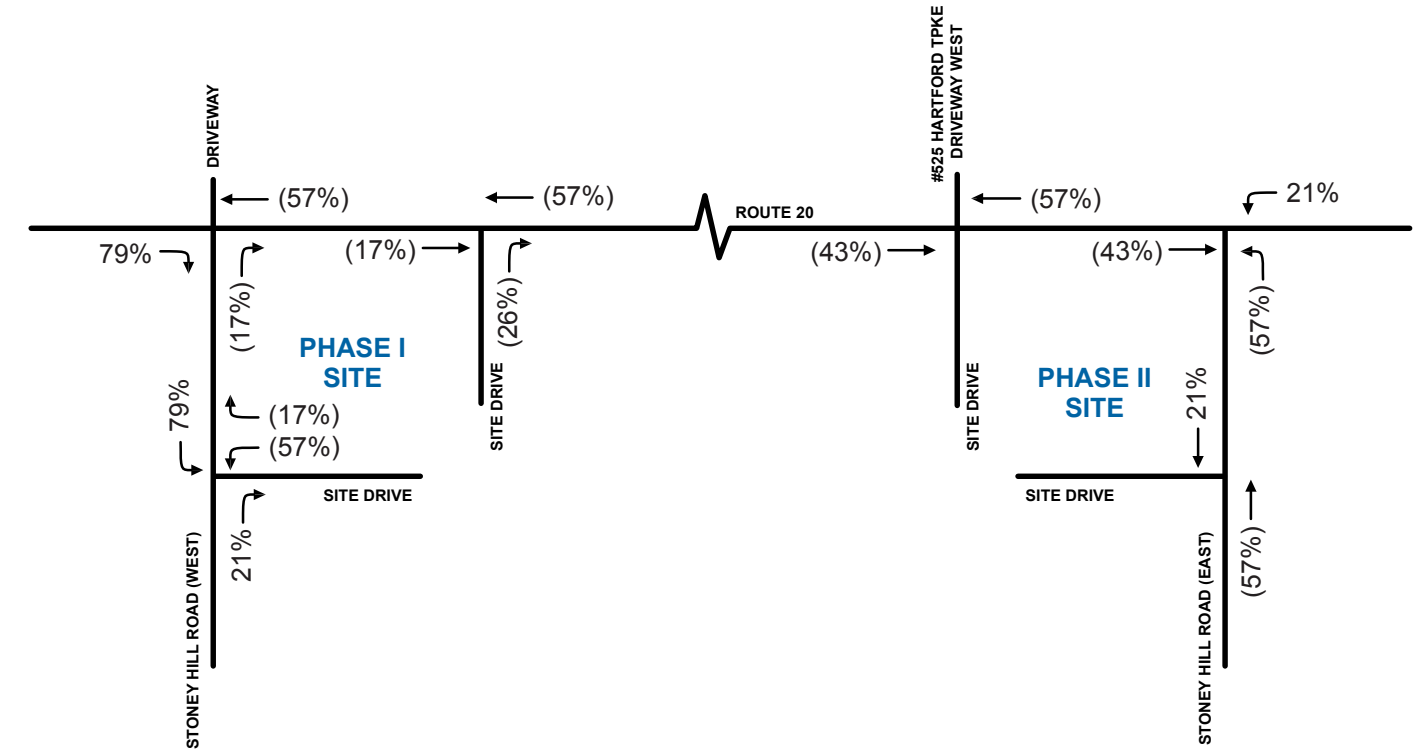
Data supporting the traffic signal warrant volumes is provided in Attachment A.

As seen in the Table 1, nine hours meet the criteria of Warrant 1 (525 vph on Route 20 and 53 vph on Stoney Hill Road). As traffic volumes for eight hours need to meet the criteria, the intersection, with the turn restrictions at Stoney Hill Road (West) and with the additional traffic generated by the proposed project, **does meet** the MassDOT requirements for installation of a traffic signal.

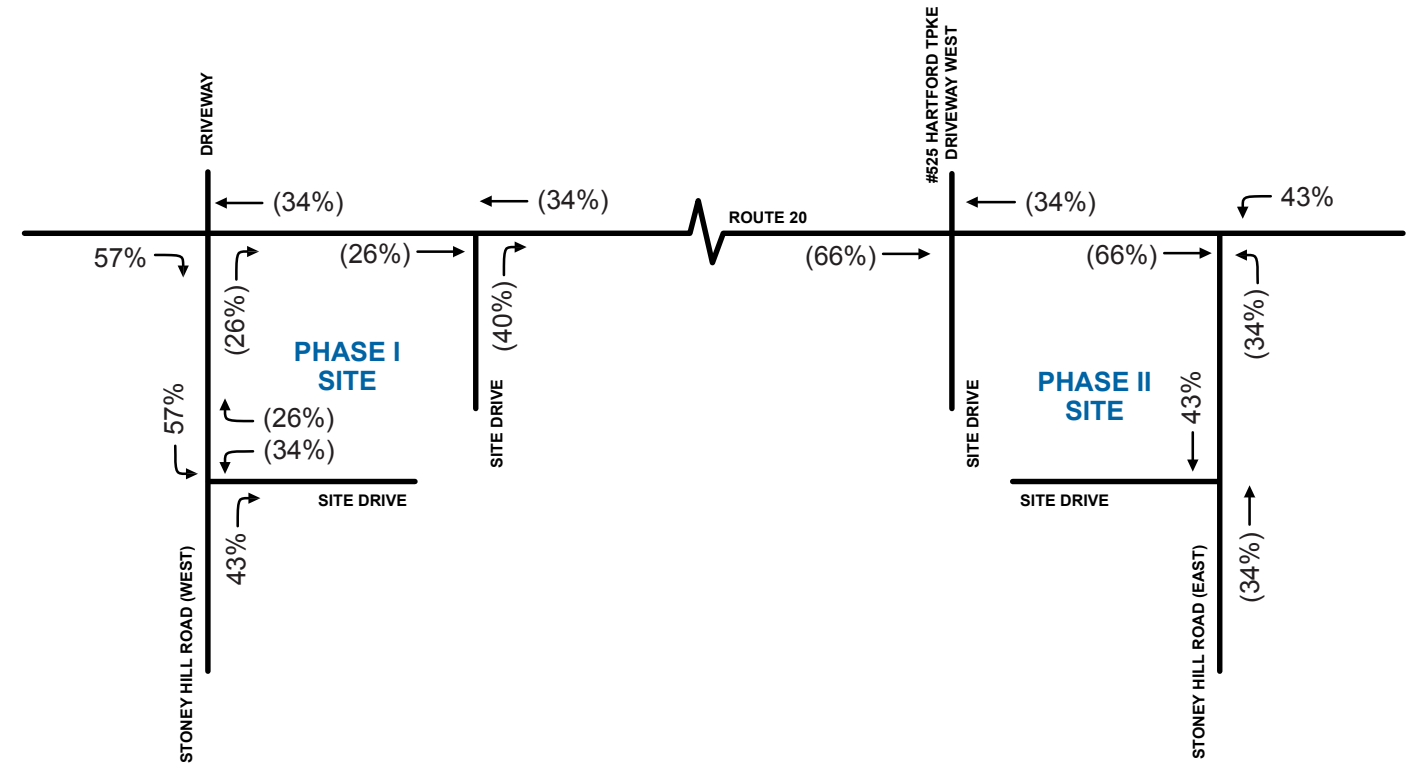
Table 1 Evaluation of MUTCD Warrant 1 – Eight-Hour for Route 20/Stoney Hill Road (East)

	Route 20 (Both Directions)				Stoney Hill Road (East)			
Hour	Existing (2015)	Redist. Trips	Project Trips	Total	Existing (2015)	Redist. Trips	Project Trips	Total
6 a.m. to 7 a.m.	1,216	0	22	1,238	24	12	36	72
7 a.m. to 8 a.m.	1,779	-2	49	1,826	54	29	89	172
8 a.m. to 9 a.m.	1,746	-2	48	1,792	48	25	79	152
9 a.m. to 10 a.m.	1,261	-1	27	1,287	25	8	38	71
10 a.m. to 11 a.m.	1,213	-1	25	1,237	19	14	37	70
11 a.m. to 12 p.m.	1,238	0	21	1,259	11	10	20	41
12 p.m. to 1p.m.	1,371	0	39	1,410	12	10	16	38
1 p.m. to 2 p.m.	1,304	0	28	1,332	15	4	16	35
2 p.m. to 3 p.m.	1,549	0	51	1,600	23	8	25	56
3 p.m. to 4 p.m.	1,728	0	79	1,808	33	13	39	85
4 p.m. to 5 p.m.	1,870	0	71	1,941	13	8	20	41
5 p.m. to 6 p.m.	1,829	0	98	1,927	32	18	40	90
6 p.m. to 7 p.m.	1,454	0	102	1,556	24	20	37	81

Note: Highlighted rows indicate hours which meet criteria for Warrant 1.



AM Peak Hour



PM Peak Hour

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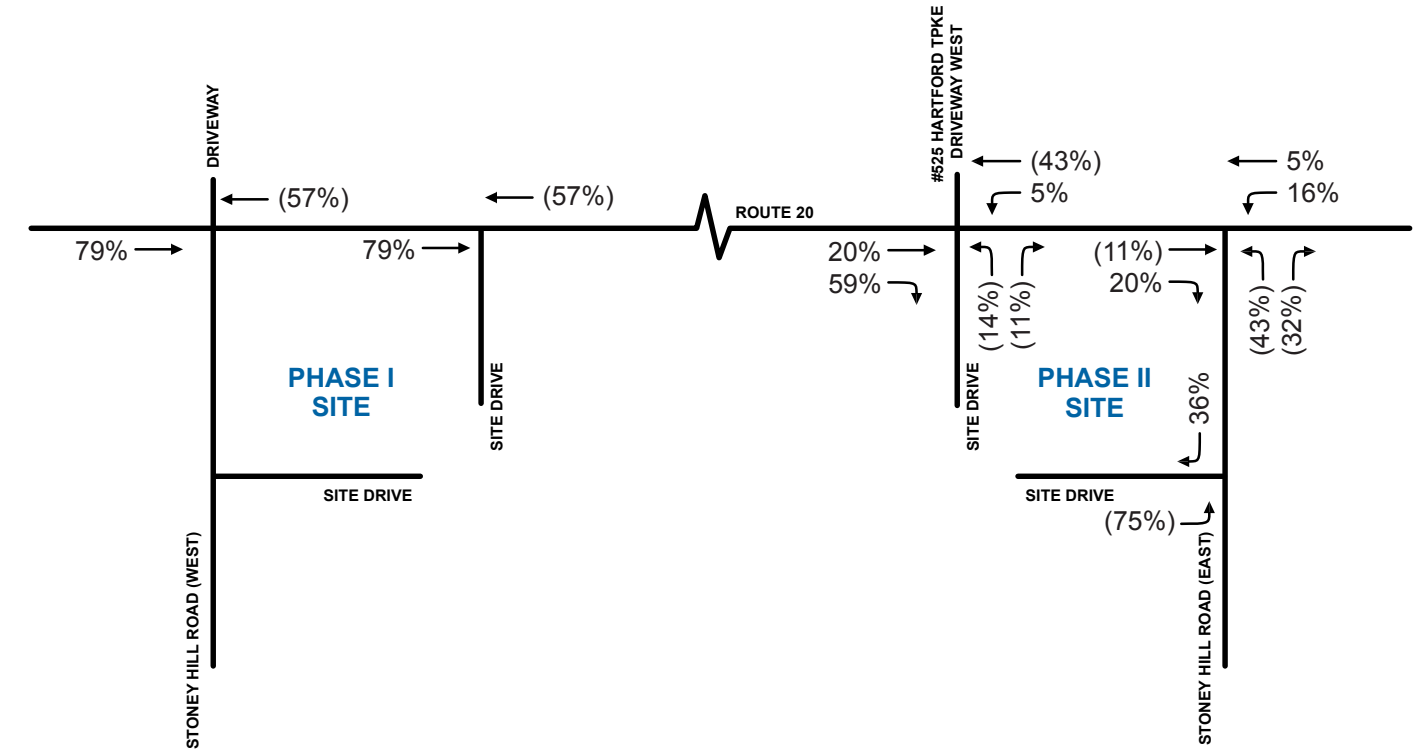
Revised
Trip Distribution (Phase I)

Figure
1



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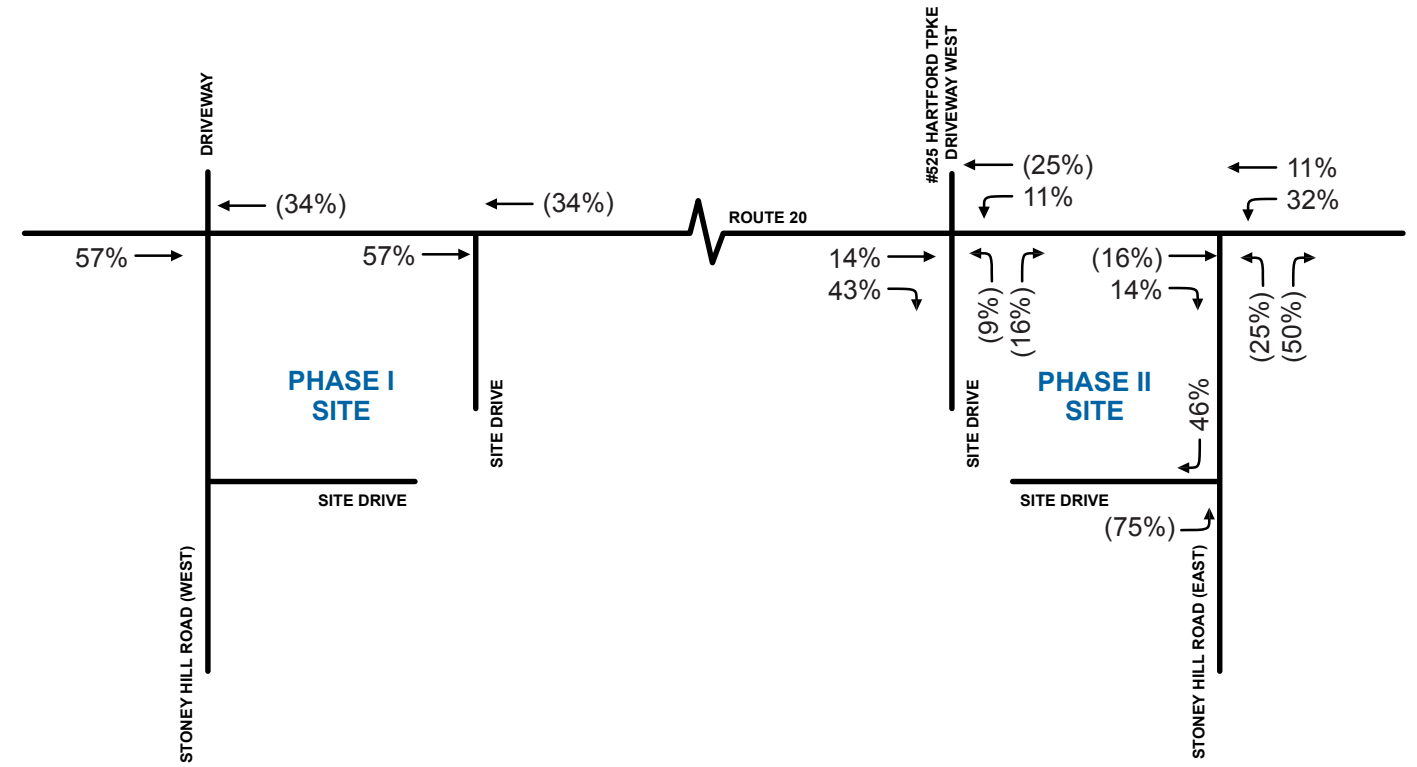

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Figure **2**

3.0 INTERSECTION VOLUMES AND CAPACITY ANALYSES

Prior to developing a conceptual design sketch for a traffic signal at the Route 20/Stoney Hill Road (East) intersection, Synchro software was utilized to determine/confirm the number of lanes, turn lane storage lengths and the traffic signal phasing and timing required to accommodate the projected 2022 Build peak hour traffic volumes.

3.1 2022 Build Traffic Volumes

The 2022 Build peak hour traffic volumes were based on future condition volumes developed in the *Traffic Impact and Access Study* (Tetra Tech, November 2015) prepared for The Pointe at Hill Farms and adjusted as follows:

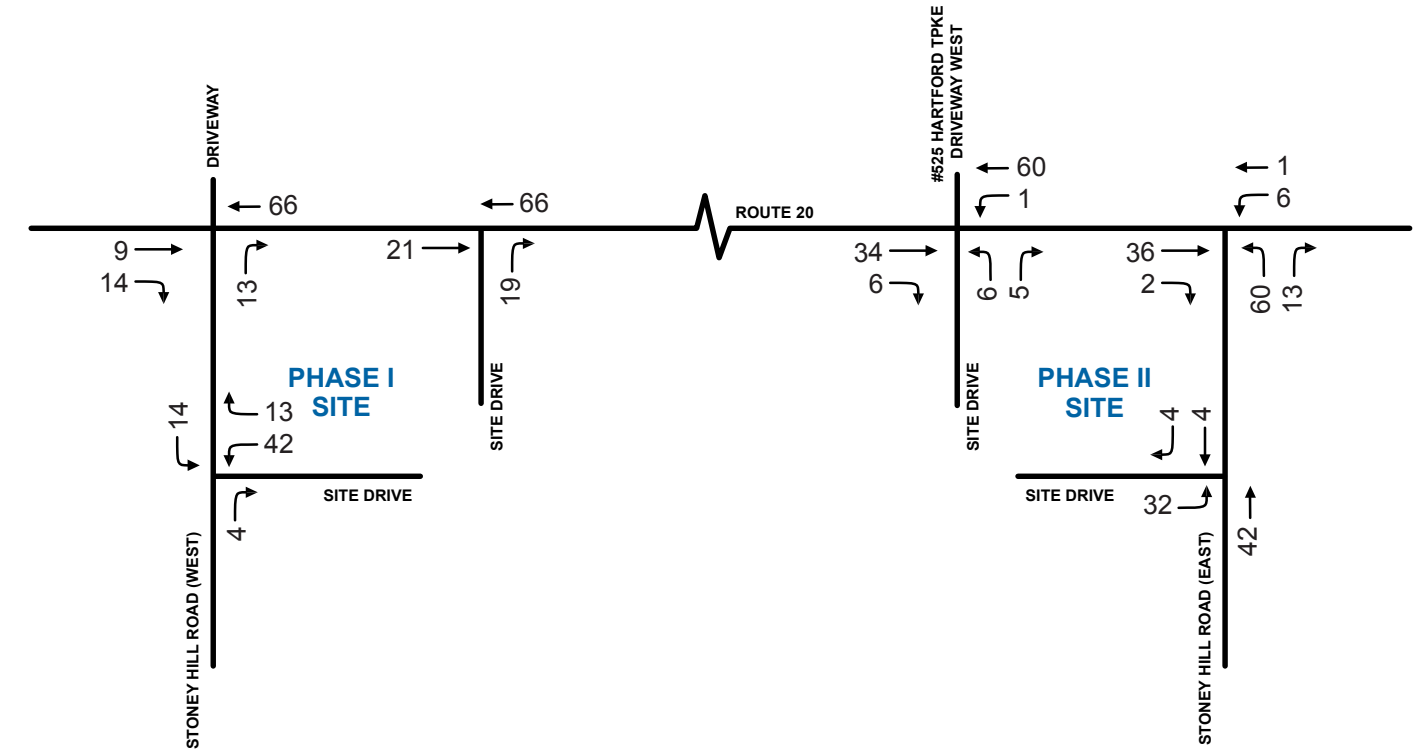
- Redistribution of 2022 No-Build traffic volumes to reflect geometric changes and traffic signal control, including:
  - A left turn from Stoney Hill Road (West) will be prohibited. All left turns from Stoney Hill Road will occur at the easterly intersection.
  - A left turn from Route 20 onto Stoney Hill Road (West) will be prohibited. All left turns onto Stoney Hill Road will occur at the easterly intersection.
  - For the morning peak hour, a portion of Stoney Hill Road (West and East) right turn volumes were redistributed to the Stoney Hill Road (East) left turn volume. Approximately 25 percent of vehicles turning right from Stoney Hill Road (West) were redistributed to the Stoney Hill Road (East) left turn volume and 30 percent of vehicles turning right from Stoney Hill Road (East) were redistributed to the Stoney Hill Road (East) left turn. With these adjustment the percentage of vehicles exiting to the west and east during the morning peak hour becomes consistent with the percentage of vehicles arriving from the west and east in the afternoon peak hour and with the US Census Journey to Work data.
- Project trips based on the trip generation included in the traffic study.
- Distribution of project trips based on data provided in the traffic study, but adjusted to reflect the turn restrictions at the Route 20/Stoney Hill Road (West) intersection. For the morning hours, adjustments were also made to reflect a lower percentage of right turning vehicles and a higher percentage of left turning vehicles. The updated project peak hour volumes are shown on Figure 3.

The updated 2022 Build peak hour traffic volumes are shown on Figure 4. Data supporting the updated 2022 Build peak hour traffic volumes is provided in Attachment B.

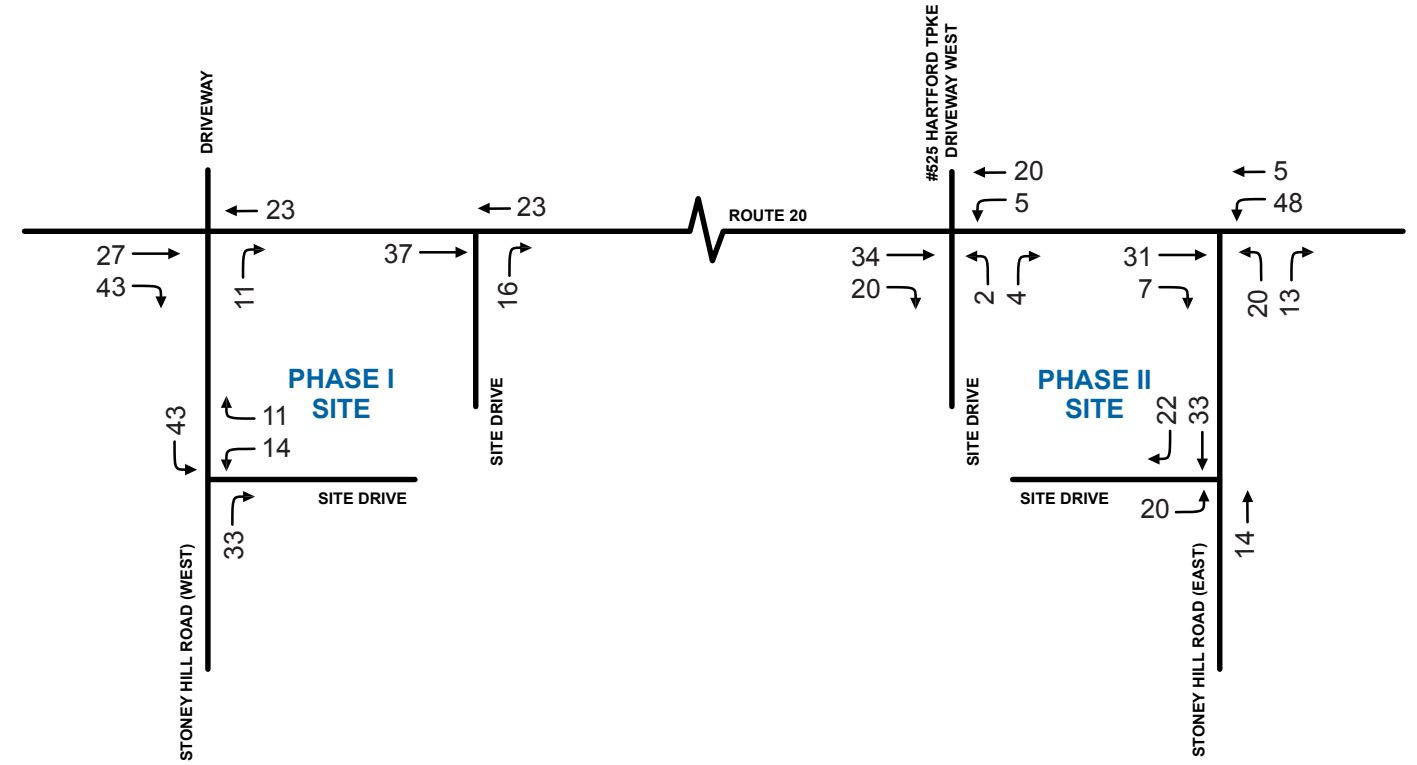
3.2 Capacity Analyses

Tetra Tech first considered an option based on the existing geometry of the intersection, but under traffic signal control. The existing geometry includes a single approach lane on the three legs of the intersection. The capacity analyses for this option shows that the intersection operates at LOS E during the morning peak hour and at LOS C during the afternoon peak hour. However, with a single lane on the Route 20 approaches, long queues are predicted to result on both approaches when controlled by a signal.

The analyses indicated that for a signalized concept to work and queues reduced to reasonable length on Route 20, an auxiliary through lane on eastbound Route 20 and an exclusive left turn lane on westbound Route 20 may be required. The capacity analysis worksheets used to develop the conceptual designs are provided in Attachment C and summarized in Table 2.



AM Peak Hour



PM Peak Hour

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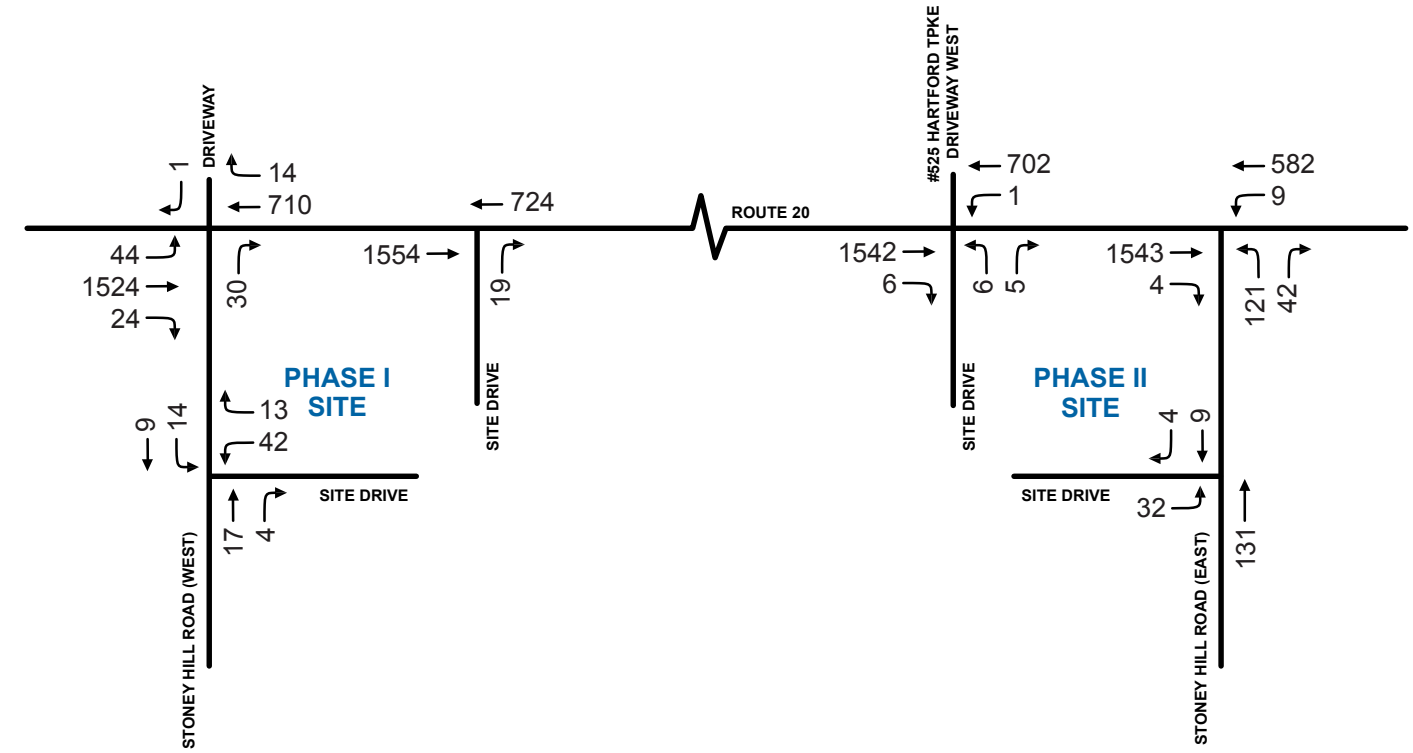
Project Trips

Figure 3



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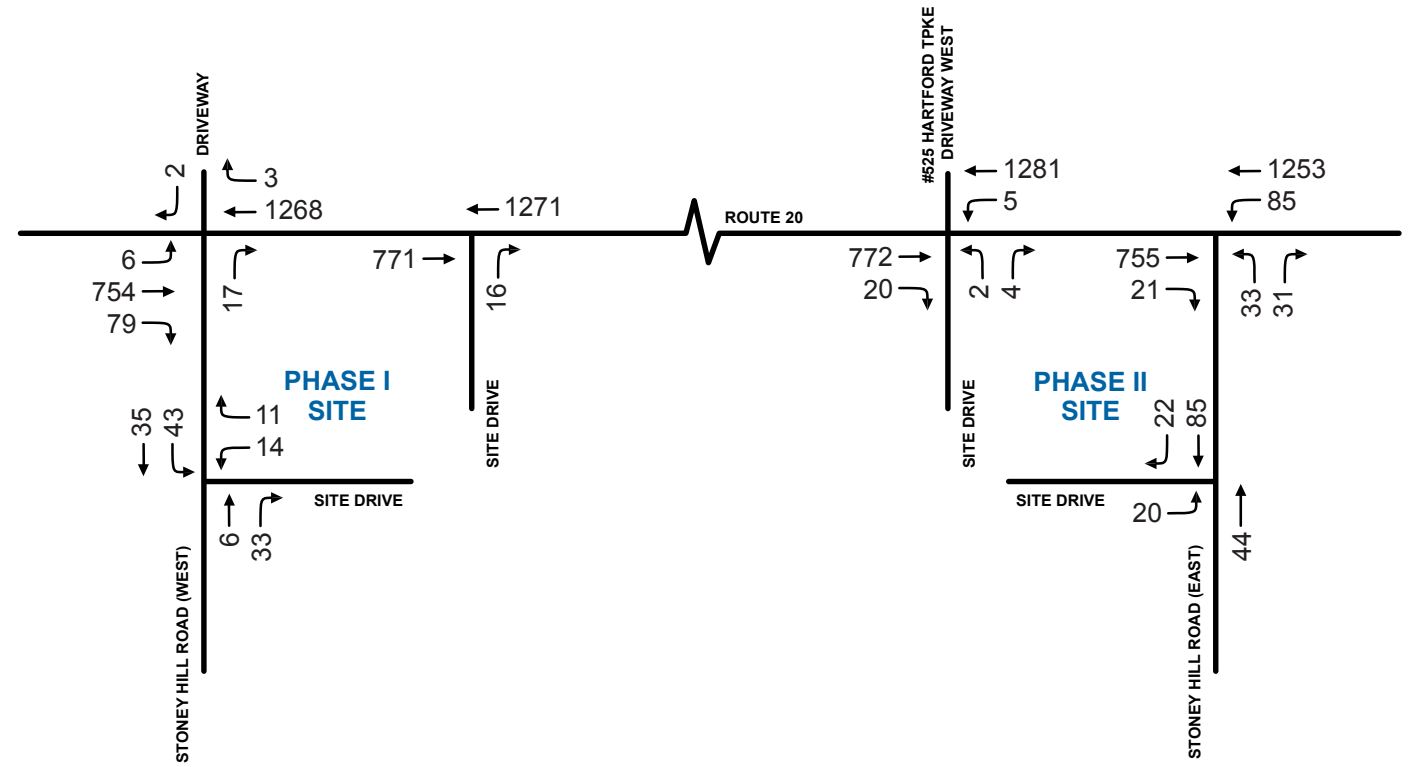

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2022 Build
Peak Hour Traffic Volumes

Figure **4**

Table 2 Intersection Capacity Analyses Summary

	Traffic Signal with Existing Geometry					Traffic Signal with Geometric Improvements				
	V/C[1]	Delay[2]	LOS[3]	50th Q[4]	95th Q[5]	V/C	Delay	LOS	50th Q	95th Q
AM Peak Hour										
Route 20 EB TH/RT	1.11	70	E	~1493	#1757	0.68	10	A	254	535
Route 20 WB LT	-	-	-	-	-	0.67	135	F	8	26
Route 20 WB LT/TH (TH)	0.75	8	A	149	296	0.48	6	A	146	249
Stoney Hill Dr. NB	1.46	304	F	~178	#326	0.71	59	E	124	194
Overall	**1.18**	**71**	**E**			**0.69**	**13**	**B**		
PM Peak Hour										
Route 20 EB TH/RT	0.54	3	A	111	155	0.33	5	A	103	152
Route 20 WB LT	-	-	-	-	-	0.54	55	E	69	120
Route 20 WB LT/TH (TH)	1.00	30	C	~853	#1445	0.83	9	A	353	590
Stoney Hill Dr. NB	0.60	70	E	31	#95	0.60	70	E	31	#95
Overall	**1.02**	**21**	**C**			**0.85**	**11**	**B**		

[1]Average delay per vehicle (seconds), [2]Volume to capacity ratio, [3]Level of Service,[4]50th percentile queue (feet), [5]95th percentile queue (feet)
~ Volume exceeds capacity, queue is theoretically infinite
# 95th percentile volume exceeds capacity, queue may be longer

Based on the results of the capacity analyses for the conceptual designs discussed above, the only concept plan developed is one that includes the geometric improvements on Route 20. A detailed description of the design and how the improved intersection would operate is provided below.

4.0 CONCEPTUAL DESIGN

The conceptual design for the Route 20/Stoney Hill Road (East) intersection is shown on Figure 5. Geometric improvements to reduce the queue on Route 20 include an 100 foot long exclusive left turn lane and shared through/right turn lane on the Route 20 westbound approach, and a through lane and 250 foot long auxiliary through lane on the Route 20 eastbound approach. The new lane configuration, including six foot wide shoulders, will require minor widening along both sides of Route 20 as shown on Figure 5. In total, approximately 12,500 s.f. of new pavement area will be required. Based on aerial photography and existing right-of-way information obtained from the MassDOT website, it appears that this widening can be accommodated within the existing Route 20 right-of-way. However, temporary construction easements would be needed on both sides of Route 20.

The traffic signal would include a three phased actuated traffic signal with a westbound protected left turn phase. It is expected that the traffic signal controller would be coordinated with the traffic signal controller at the Route 20/Centech Boulevard/Cherry Street intersection located approximately 1,900 feet east of Stoney Hill Road.

This concept provides acceptable levels of service for the 2022 peak hours (LOS B) for both peak hours. The average vehicle queue lengths on Route 20 extend approximately 250 feet during the morning peak hour on the eastbound approach and approximately 350 feet during the afternoon peak hour on the westbound approach.

Figure 6 depicts a concept plan of the proposed modifications at the Route 20/Stoney Hill Road (West) intersection required to restrict the intersection to right in/right out turns and a new design for the Route 20/Phase I Site Driveway. The proposed geometry at Stoney Hill Road (West) was designed to allow Shrewsbury Fire apparatus to turn either left or right onto Stoney Hill Road. The existing flare and radius at the westerly corner of

the intersection was maintained. The modifications also include new sidewalk from Stoney Hill Road Plaza to the proposed Phase I Site Driveway.

At the Phase I Route 20 site driveway, only a right turn from the driveway onto Route 20 will be allowed. Site traffic arriving from the west will turn right onto Stoney Hill Road and then left onto the proposed site driveway to access the Phase I site. A truck apron defined by sloped granite edging and scored concrete will allow Shrewsbury Fire apparatus to turn left into the site.

Attachment A – Traffic Signal Warrant Volumes
Attachment B – Updated 2022 Build Condition Peak Hour Volumes
Attachment C – Capacity Analyses

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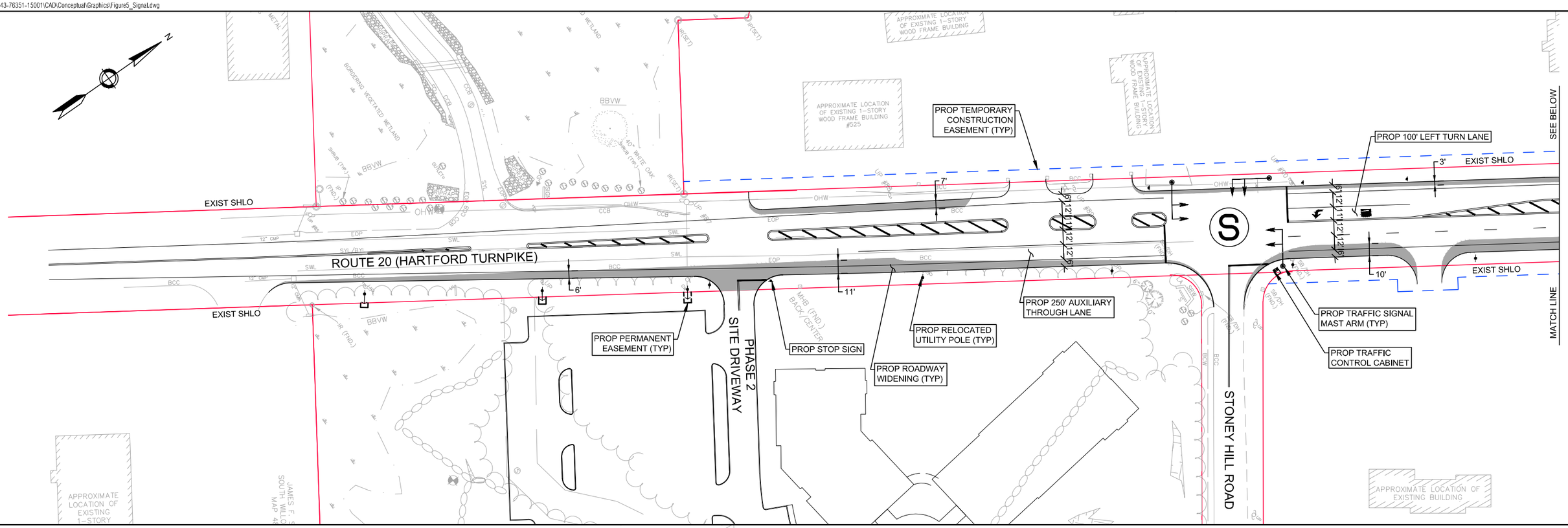
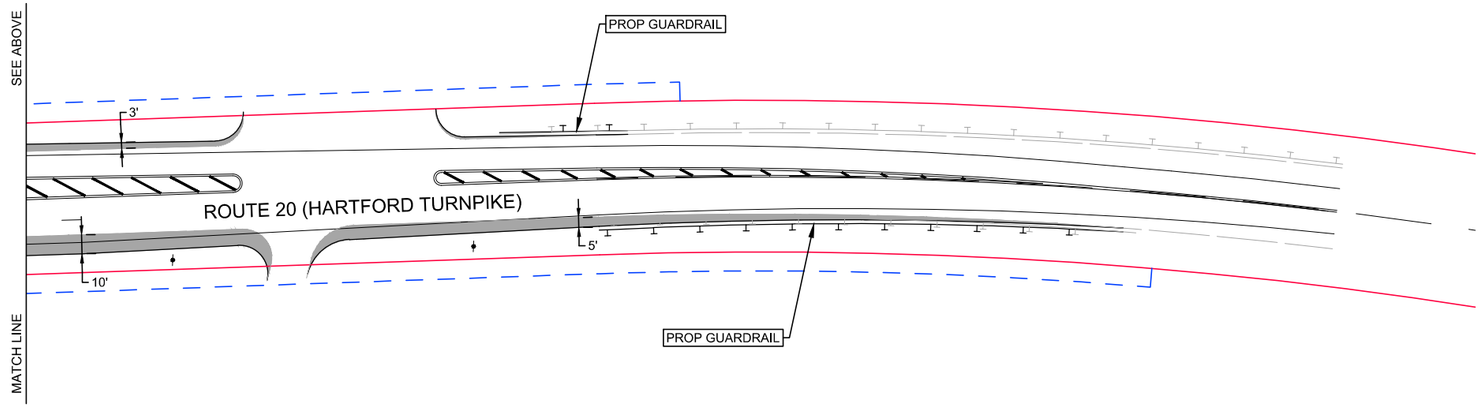


Legend

- Proposed Widening
- Existing Layout / Property Line
- Proposed Temporary Construction Easement

Abbreviations

SHLO	State Highway Layout



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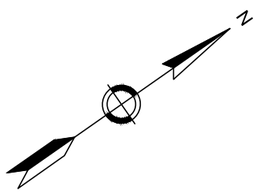
Route 20 / Stoney Hill Road (East)
Traffic Signal Concept Plan

Figure 5



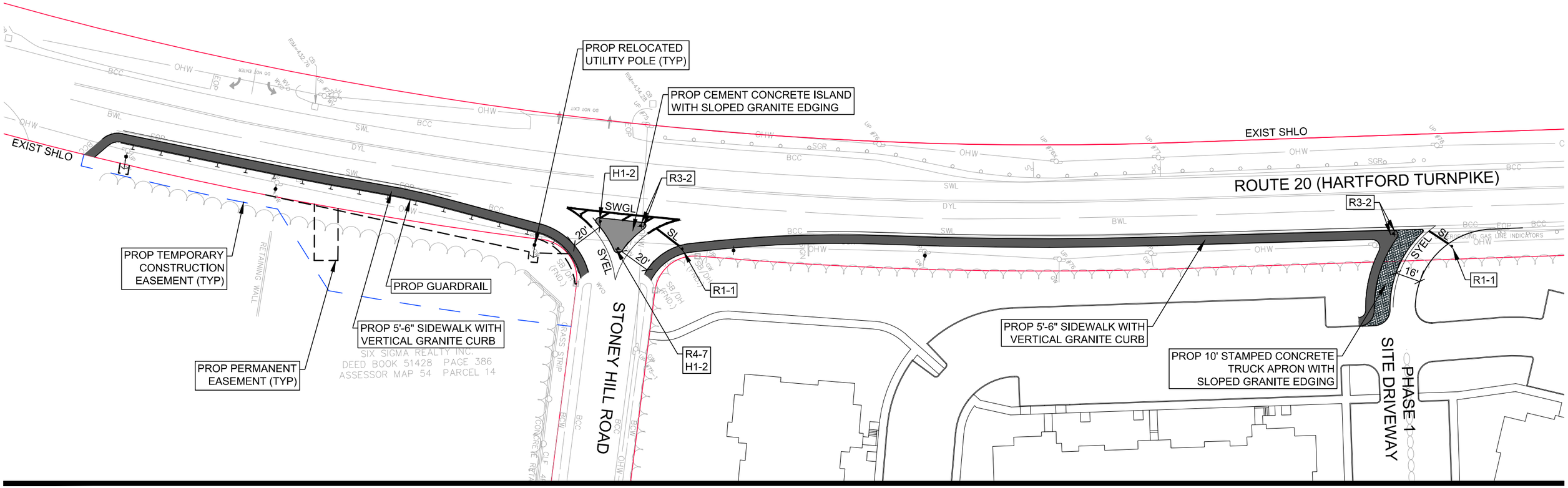
Legend

- Proposed Sidewalk
- Proposed Cement Concrete Island
- Proposed Stamped Concrete Truck Apron
- Existing Layout / Property Line
- Proposed Temporary Construction Easement

Abbreviations

SHLO	State Highway Layout
SL	Stop Line
SWGL	Solid White Gore Line
SYEL	Solid Yellow End Line

IDENTIFICATION NUMBER	SIZE OF SIGN (INCHES)		TEXT	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND (NUMBER REQUIRED)	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACK-GROUND	LEGEND	BORDER			
H1-2	24	24		SEE MASS DOT STANDARD			-	SEE MASS DOT STANDARD			EACH	EACH	EACH
R1-1	30	30		SEE 2009 MUTCD			-	SEE 2009 MUTCD			–	6.25	--
R3-2	36	36		SEE 2009 MUTCD			-	SEE 2009 MUTCD			–	9.00	--
R4-7	24	30		SEE 2009 MUTCD			-	SEE 2009 MUTCD			–	5.00	--



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Shrewsbury, Massachusetts

Route 20 / Stoney Hill Road (West)
Right-In / Right-Out Concept Plan

Figure 6

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508.786.2200
www.tetratech.com

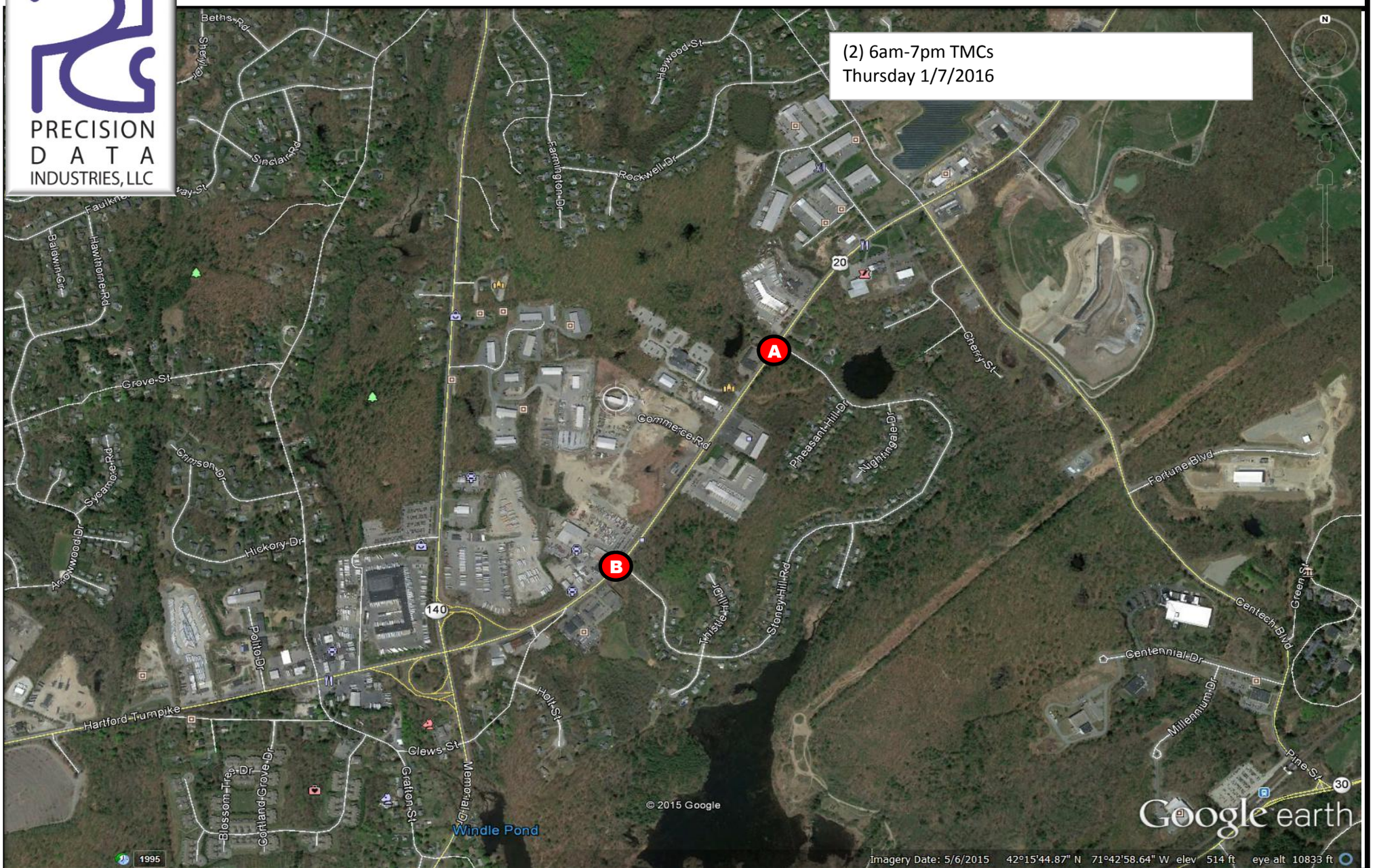
ATTACHMENT A – TRAFFIC SIGNAL WARRANT VOLUMES

January 7, 2015 Traffic Volumes

- **Route 20/Stoney Hill Road West**
- **Route 20/Stoney Hill Road East**
- **Seasonal Adjustment Factor**

PRECISION DATA INDUSTRIES, LLC

Location Map: 164876 Shrewsbury, MA



Client:	Engineer:	Site Code:	Date:	PDI Job #	City, State:
TetraTech	N. Doherty	TBA	Thursday 1/7/2016	164876	Shrewsbury, MA

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
06:00 AM	55	1	0	5	0	0	0	155	0	216
06:15 AM	67	0	0	5	2	0	0	164	0	238
06:30 AM	67	1	0	1	2	0	1	246	0	318
06:45 AM	77	1	0	7	1	0	1	314	0	401
Total	266	3	0	18	5	0	2	879	0	1173
07:00 AM	100	1	0	15	4	0	0	262	0	382
07:15 AM	117	1	0	5	0	0	0	279	0	402
07:30 AM	114	3	0	10	2	0	2	329	0	460
07:45 AM	126	1	0	8	7	0	1	347	0	490
Total	457	6	0	38	13	0	3	1217	0	1734
08:00 AM	114	1	0	10	3	0	1	302	0	431
08:15 AM	109	0	0	9	0	0	1	306	0	425
08:30 AM	114	2	0	9	2	0	1	314	0	442
08:45 AM	133	1	0	11	1	0	1	252	0	399
Total	470	4	0	39	6	0	4	1174	0	1697
09:00 AM	109	3	0	6	1	0	1	172	0	292
09:15 AM	104	3	0	3	0	0	1	207	0	318
09:30 AM	108	1	0	6	0	0	0	201	0	316
09:45 AM	110	1	0	6	2	0	1	171	0	291
Total	431	8	0	21	3	0	3	751	0	1217
10:00 AM	110	3	0	5	1	0	0	150	0	269
10:15 AM	143	3	0	2	1	0	1	169	0	319
10:30 AM	145	2	0	4	0	0	0	142	0	293
10:45 AM	124	3	0	4	1	0	0	153	0	285
Total	522	11	0	15	3	0	1	614	0	1166
11:00 AM	128	0	0	2	1	0	0	156	0	287
11:15 AM	137	5	0	1	0	0	3	161	0	307
11:30 AM	135	1	0	1	2	0	1	145	0	285
11:45 AM	146	3	0	2	1	0	1	149	0	302
Total	546	9	0	6	4	0	5	611	0	1181
12:00 PM	174	5	0	3	1	0	1	120	0	304
12:15 PM	169	2	0	1	0	0	0	158	0	330
12:30 PM	156	6	0	1	0	0	0	175	0	338
12:45 PM	169	4	0	4	1	0	2	156	0	336
Total	668	17	0	9	2	0	3	609	0	1308
01:00 PM	165	2	0	3	1	0	1	157	0	329
01:15 PM	173	1	0	4	1	0	0	153	0	332
01:30 PM	159	1	0	3	2	0	0	137	0	302
01:45 PM	136	1	0	0	0	0	1	147	0	285
Total	633	5	0	10	4	0	2	594	0	1248
02:00 PM	182	4	0	1	0	0	0	141	0	328
02:15 PM	186	0	0	0	2	0	4	146	0	338
02:30 PM	189	6	0	6	1	0	3	191	0	396
02:45 PM	213	3	0	8	4	0	4	193	0	425
Total	770	13	0	15	7	0	11	671	0	1487
03:00 PM	237	7	0	4	4	0	4	156	0	412
03:15 PM	208	3	0	9	0	0	3	135	0	358
03:30 PM	287	8	0	5	1	0	2	161	0	464
03:45 PM	241	4	0	7	1	0	3	176	0	432
Total	973	22	0	25	6	0	12	628	0	1666

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Cars - Heavy Vehicles

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	264	2	0	1	0	0	3	148	0	418
04:15 PM	275	7	0	4	0	0	3	150	0	439
04:30 PM	312	4	0	1	0	0	3	162	0	482
04:45 PM	267	6	0	4	2	0	9	154	0	442
Total	1118	19	0	10	2	0	18	614	0	1781
05:00 PM	284	5	0	6	0	0	1	139	0	435
05:15 PM	316	8	0	6	1	0	5	157	0	493
05:30 PM	231	14	0	7	3	0	1	152	0	408
05:45 PM	230	8	1	6	1	0	0	178	0	424
Total	1061	35	1	25	5	0	7	626	0	1760
06:00 PM	241	19	0	3	1	0	2	138	0	404
06:15 PM	223	12	0	7	2	0	2	117	0	363
06:30 PM	189	10	0	7	0	0	2	132	0	340
06:45 PM	176	5	0	3	0	0	2	106	0	292
Total	829	46	0	20	3	0	8	493	0	1399
Grand Total	8744	198	1	251	63	0	79	9481	0	18817
Apprch %	97.8	2.2	0	79.9	20.1	0	0.8	99.2	0	
Total %	46.5	1.1	0	1.3	0.3	0	0.4	50.4	0	
Cars	7941	194	1	236	61	0	77	8667	0	17177
% Cars	90.8	98	100	94	96.8	0	97.5	91.4	0	91.3
Heavy Vehicles	803	4	0	15	2	0	2	814	0	1640
% Heavy Vehicles	9.2	2	0	6	3.2	0	2.5	8.6	0	8.7

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	114	**3**	0	117	**10**	2	0	12	**2**	329	0	331	460
07:45 AM	**126**	1	0	**127**	8	**7**	0	**15**	1	**347**	0	**348**	**490**
08:00 AM	114	1	0	115	10	3	0	13	1	302	0	303	431
08:15 AM	109	0	0	109	9	0	0	9	1	306	0	307	425
Total Volume	463	5	0	468	37	12	0	49	5	1284	0	1289	1806
% App. Total	98.9	1.1	0		75.5	24.5	0		0.4	99.6	0		
PHF	.919	.417	.000	.921	.925	.429	.000	.817	.625	.925	.000	.926	.921
Cars	407	4	0	411	34	11	0	45	5	1197	0	1202	1658
% Cars	87.9	80.0	0	87.8	91.9	91.7	0	91.8	100	93.2	0	93.3	91.8
Heavy Vehicles	56	1	0	57	3	1	0	4	0	87	0	87	148
% Heavy Vehicles	12.1	20.0	0	12.2	8.1	8.3	0	8.2	0	6.8	0	6.7	8.2
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:30 PM													
12:30 PM	156	**6**	0	162	1	0	0	1	0	**175**	0	**175**	**338**
12:45 PM	169	4	0	173	**4**	**1**	0	**5**	**2**	156	0	158	336
01:00 PM	165	2	0	167	3	1	0	4	1	157	0	158	329
01:15 PM	**173**	1	0	**174**	4	1	0	5	0	153	0	153	332
Total Volume	663	13	0	676	12	3	0	15	3	641	0	644	1335
% App. Total	98.1	1.9	0		80	20	0		0.5	99.5	0		
PHF	.958	.542	.000	.971	.750	.750	.000	.750	.375	.916	.000	.920	.987
Cars	582	13	0	595	12	3	0	15	3	588	0	591	1201
% Cars	87.8	100	0	88.0	100	100	0	100	100	91.7	0	91.8	90.0
Heavy Vehicles	81	0	0	81	0	0	0	0	0	53	0	53	134
% Heavy Vehicles	12.2	0	0	12.0	0	0	0	0	0	8.3	0	8.2	10.0

PRECISION
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S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	312	4	0	316	1	0	0	1	3	**162**	0	**165**	482
04:45 PM	267	6	0	273	4	**2**	0	6	**9**	154	0	163	442
05:00 PM	284	5	0	289	**6**	0	0	6	1	139	0	140	435
05:15 PM	**316**	**8**	0	**324**	6	1	0	**7**	5	157	0	162	**493**
Total Volume	1179	23	0	1202	17	3	0	20	18	612	0	630	1852
% App. Total	98.1	1.9	0		85	15	0		2.9	97.1	0		
PHF	.933	.719	.000	.927	.708	.375	.000	.714	.500	.944	.000	.955	.939
Cars	1135	23	0	1158	16	3	0	19	17	578	0	595	1772
% Cars	96.3	100	0	96.3	94.1	100	0	95.0	94.4	94.4	0	94.4	95.7
Heavy Vehicles	44	0	0	44	1	0	0	1	1	34	0	35	80
% Heavy Vehicles	3.7	0	0	3.7	5.9	0	0	5.0	5.6	5.6	0	5.6	4.3

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File Name : 164876 A
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Page No : 1

Groups Printed- Cars

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
06:00 AM	45	1	0	5	0	0	0	141	0	192
06:15 AM	45	0	0	4	2	0	0	152	0	203
06:30 AM	61	1	0	1	2	0	1	231	0	297
06:45 AM	68	1	0	6	1	0	0	300	0	376
Total	219	3	0	16	5	0	1	824	0	1068
07:00 AM	92	1	0	14	4	0	0	239	0	350
07:15 AM	106	1	0	5	0	0	0	261	0	373
07:30 AM	105	2	0	8	2	0	2	306	0	425
07:45 AM	113	1	0	8	6	0	1	324	0	453
Total	416	5	0	35	12	0	3	1130	0	1601
08:00 AM	98	1	0	10	3	0	1	276	0	389
08:15 AM	91	0	0	8	0	0	1	291	0	391
08:30 AM	97	2	0	8	2	0	1	284	0	394
08:45 AM	113	1	0	11	1	0	1	236	0	363
Total	399	4	0	37	6	0	4	1087	0	1537
09:00 AM	86	3	0	6	1	0	1	149	0	246
09:15 AM	91	3	0	3	0	0	1	178	0	276
09:30 AM	90	1	0	6	0	0	0	169	0	266
09:45 AM	90	0	0	6	1	0	1	147	0	245
Total	357	7	0	21	2	0	3	643	0	1033
10:00 AM	89	3	0	5	1	0	0	137	0	235
10:15 AM	119	2	0	2	1	0	1	157	0	282
10:30 AM	116	2	0	4	0	0	0	128	0	250
10:45 AM	108	3	0	4	1	0	0	136	0	252
Total	432	10	0	15	3	0	1	558	0	1019
11:00 AM	109	0	0	2	1	0	0	134	0	246
11:15 AM	120	5	0	1	0	0	3	141	0	270
11:30 AM	120	1	0	1	2	0	1	132	0	257
11:45 AM	111	3	0	2	1	0	1	130	0	248
Total	460	9	0	6	4	0	5	537	0	1021
12:00 PM	156	5	0	2	1	0	1	110	0	275
12:15 PM	150	2	0	1	0	0	0	149	0	302
12:30 PM	133	6	0	1	0	0	0	166	0	306
12:45 PM	153	4	0	4	1	0	2	144	0	308
Total	592	17	0	8	2	0	3	569	0	1191
01:00 PM	141	2	0	3	1	0	1	139	0	287
01:15 PM	155	1	0	4	1	0	0	139	0	300
01:30 PM	139	1	0	3	2	0	0	125	0	270
01:45 PM	117	1	0	0	0	0	1	131	0	250
Total	552	5	0	10	4	0	2	534	0	1107
02:00 PM	170	4	0	1	0	0	0	125	0	300
02:15 PM	167	0	0	0	2	0	4	135	0	308
02:30 PM	177	6	0	6	1	0	3	178	0	371
02:45 PM	196	3	0	6	4	0	4	177	0	390
Total	710	13	0	13	7	0	11	615	0	1369
03:00 PM	213	6	0	4	4	0	4	137	0	368
03:15 PM	196	3	0	8	0	0	3	115	0	325
03:30 PM	273	8	0	5	1	0	2	144	0	433
03:45 PM	223	4	0	5	1	0	3	155	0	391
Total	905	21	0	22	6	0	12	551	0	1517

PRECISION
D A T A
INDUSTRIES, LLC
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S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Cars

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	249	2	0	1	0	0	3	131	0	386
04:15 PM	265	7	0	4	0	0	3	142	0	421
04:30 PM	299	4	0	1	0	0	3	152	0	459
04:45 PM	252	6	0	4	2	0	8	148	0	420
Total	1065	19	0	10	2	0	17	573	0	1686
05:00 PM	276	5	0	5	0	0	1	132	0	419
05:15 PM	308	8	0	6	1	0	5	146	0	474
05:30 PM	219	14	0	7	3	0	1	142	0	386
05:45 PM	227	8	1	6	1	0	0	166	0	409
Total	1030	35	1	24	5	0	7	586	0	1688
06:00 PM	232	19	0	3	1	0	2	124	0	381
06:15 PM	221	12	0	7	2	0	2	108	0	352
06:30 PM	181	10	0	6	0	0	2	126	0	325
06:45 PM	170	5	0	3	0	0	2	102	0	282
Total	804	46	0	19	3	0	8	460	0	1340
Grand Total	7941	194	1	236	61	0	77	8667	0	17177
Apprch %	97.6	2.4	0	79.5	20.5	0	0.9	99.1	0	
Total %	46.2	1.1	0	1.4	0.4	0	0.4	50.5	0	

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	105	**2**	0	107	8	2	0	10	**2**	306	0	308	425
07:45 AM	**113**	1	0	**114**	8	**6**	0	**14**	1	**324**	0	**325**	**453**
08:00 AM	98	1	0	99	**10**	3	0	13	1	276	0	277	389
08:15 AM	91	0	0	91	8	0	0	8	1	291	0	292	391
Total Volume	407	4	0	411	34	11	0	45	5	1197	0	1202	1658
% App. Total	99	1	0		75.6	24.4	0		0.4	99.6	0		
PHF	.900	.500	.000	.901	.850	.458	.000	.804	.625	.924	.000	.925	.915
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:15 PM													
12:15 PM	150	2	0	152	1	0	0	1	0	149	0	149	302
12:30 PM	133	**6**	0	139	1	0	0	1	0	**166**	0	**166**	306
12:45 PM	**153**	4	0	**157**	**4**	**1**	0	**5**	**2**	144	0	146	**308**
01:00 PM	141	2	0	143	3	1	0	4	1	139	0	140	287
Total Volume	577	14	0	591	9	2	0	11	3	598	0	601	1203
% App. Total	97.6	2.4	0		81.8	18.2	0		0.5	99.5	0		
PHF	.943	.583	.000	.941	.563	.500	.000	.550	.375	.901	.000	.905	.976
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	299	4	0	303	1	0	0	1	3	**152**	0	155	459
04:45 PM	252	6	0	258	4	**2**	0	6	**8**	148	0	**156**	420
05:00 PM	276	5	0	281	5	0	0	5	1	132	0	133	419
05:15 PM	**308**	**8**	0	**316**	**6**	1	0	**7**	5	146	0	151	**474**
Total Volume	1135	23	0	1158	16	3	0	19	17	578	0	595	1772
% App. Total	98	2	0		84.2	15.8	0		2.9	97.1	0		
PHF	.921	.719	.000	.916	.667	.375	.000	.679	.531	.951	.000	.954	.935

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Groups Printed- Heavy Vehicles

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
06:00 AM	10	0	0	0	0	0	0	14	0	24
06:15 AM	22	0	0	1	0	0	0	12	0	35
06:30 AM	6	0	0	0	0	0	0	15	0	21
06:45 AM	9	0	0	1	0	0	1	14	0	25
Total	47	0	0	2	0	0	1	55	0	105
07:00 AM	8	0	0	1	0	0	0	23	0	32
07:15 AM	11	0	0	0	0	0	0	18	0	29
07:30 AM	9	1	0	2	0	0	0	23	0	35
07:45 AM	13	0	0	0	1	0	0	23	0	37
Total	41	1	0	3	1	0	0	87	0	133
08:00 AM	16	0	0	0	0	0	0	26	0	42
08:15 AM	18	0	0	1	0	0	0	15	0	34
08:30 AM	17	0	0	1	0	0	0	30	0	48
08:45 AM	20	0	0	0	0	0	0	16	0	36
Total	71	0	0	2	0	0	0	87	0	160
09:00 AM	23	0	0	0	0	0	0	23	0	46
09:15 AM	13	0	0	0	0	0	0	29	0	42
09:30 AM	18	0	0	0	0	0	0	32	0	50
09:45 AM	20	1	0	0	1	0	0	24	0	46
Total	74	1	0	0	1	0	0	108	0	184
10:00 AM	21	0	0	0	0	0	0	13	0	34
10:15 AM	24	1	0	0	0	0	0	12	0	37
10:30 AM	29	0	0	0	0	0	0	14	0	43
10:45 AM	16	0	0	0	0	0	0	17	0	33
Total	90	1	0	0	0	0	0	56	0	147
11:00 AM	19	0	0	0	0	0	0	22	0	41
11:15 AM	17	0	0	0	0	0	0	20	0	37
11:30 AM	15	0	0	0	0	0	0	13	0	28
11:45 AM	35	0	0	0	0	0	0	19	0	54
Total	86	0	0	0	0	0	0	74	0	160
12:00 PM	18	0	0	1	0	0	0	10	0	29
12:15 PM	19	0	0	0	0	0	0	9	0	28
12:30 PM	23	0	0	0	0	0	0	9	0	32
12:45 PM	16	0	0	0	0	0	0	12	0	28
Total	76	0	0	1	0	0	0	40	0	117
01:00 PM	24	0	0	0	0	0	0	18	0	42
01:15 PM	18	0	0	0	0	0	0	14	0	32
01:30 PM	20	0	0	0	0	0	0	12	0	32
01:45 PM	19	0	0	0	0	0	0	16	0	35
Total	81	0	0	0	0	0	0	60	0	141
02:00 PM	12	0	0	0	0	0	0	16	0	28
02:15 PM	19	0	0	0	0	0	0	11	0	30
02:30 PM	12	0	0	0	0	0	0	13	0	25
02:45 PM	17	0	0	2	0	0	0	16	0	35
Total	60	0	0	2	0	0	0	56	0	118
03:00 PM	24	1	0	0	0	0	0	19	0	44
03:15 PM	12	0	0	1	0	0	0	20	0	33
03:30 PM	14	0	0	0	0	0	0	17	0	31
03:45 PM	18	0	0	2	0	0	0	21	0	41
Total	68	1	0	3	0	0	0	77	0	149

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Heavy Vehicles

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	15	0	0	0	0	0	0	17	0	32
04:15 PM	10	0	0	0	0	0	0	8	0	18
04:30 PM	13	0	0	0	0	0	0	10	0	23
04:45 PM	15	0	0	0	0	0	1	6	0	22
Total	53	0	0	0	0	0	1	41	0	95
05:00 PM	8	0	0	1	0	0	0	7	0	16
05:15 PM	8	0	0	0	0	0	0	11	0	19
05:30 PM	12	0	0	0	0	0	0	10	0	22
05:45 PM	3	0	0	0	0	0	0	12	0	15
Total	31	0	0	1	0	0	0	40	0	72
06:00 PM	9	0	0	0	0	0	0	14	0	23
06:15 PM	2	0	0	0	0	0	0	9	0	11
06:30 PM	8	0	0	1	0	0	0	6	0	15
06:45 PM	6	0	0	0	0	0	0	4	0	10
Total	25	0	0	1	0	0	0	33	0	59
Grand Total	803	4	0	15	2	0	2	814	0	1640
Apprch %	99.5	0.5	0	88.2	11.8	0	0.2	99.8	0	
Total %	49	0.2	0	0.9	0.1	0	0.1	49.6	0	

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 09:00 AM													
09:00 AM	**23**	0	0	**23**	0	0	0	0	0	23	0	23	46
09:15 AM	13	0	0	13	0	0	0	0	0	29	0	29	42
09:30 AM	18	0	0	18	0	0	0	0	0	**32**	0	**32**	**50**
09:45 AM	20	**1**	0	21	0	**1**	0	**1**	0	24	0	24	46
Total Volume	74	1	0	75	0	1	0	1	0	108	0	108	184
% App. Total	98.7	1.3	0		0	100	0		0	100	0		
PHF	.804	.250	.000	.815	.000	.250	.000	.250	.000	.844	.000	.844	.920
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 11:00 AM													
11:00 AM	19	0	0	19	0	0	0	0	0	**22**	0	**22**	41
11:15 AM	17	0	0	17	0	0	0	0	0	20	0	20	37
11:30 AM	15	0	0	15	0	0	0	0	0	13	0	13	28
11:45 AM	**35**	0	0	**35**	0	0	0	0	0	19	0	19	**54**
Total Volume	86	0	0	86	0	0	0	0	0	74	0	74	160
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.614	.000	.000	.614	.000	.000	.000	.000	.000	.841	.000	.841	.741
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:00 PM													
03:00 PM	**24**	**1**	0	**25**	0	0	0	0	0	19	0	19	**44**
03:15 PM	12	0	0	12	1	0	0	1	0	20	0	20	33
03:30 PM	14	0	0	14	0	0	0	0	0	17	0	17	31
03:45 PM	18	0	0	18	**2**	0	0	**2**	0	**21**	0	**21**	41
Total Volume	68	1	0	69	3	0	0	3	0	77	0	77	149
% App. Total	98.6	1.4	0		100	0	0		0	100	0		
PHF	.708	.250	.000	.690	.375	.000	.000	.375	.000	.917	.000	.917	.847

PRECISION
D A T A
INDUSTRIES, LLC
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Email: datarequests@pdillc.com

S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

Groups Printed- Peds and Bicycles

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0

PRECISION
D A T A
INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Peds and Bicycles

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	Peds SB	Peds NB	Right	Left	Peds WB	Peds EB	Right	Thru	Peds NB	Peds SB	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	0	0	1
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	1	0	1	2
Apprch %	0	0	0	0	0	0	0	0	0	50	0	50	
Total %	0	0	0	0	0	0	0	0	0	50	0	50	

	Hartford Turnpike (Route 20) From East					Stoney Hill Road (East) From South					Hartford Turnpike (Route 20) From West					
Start Time	Thru	Left	Peds SB	Peds NB	App. Total	Right	Left	Peds WB	Peds EB	App. Total	Right	Thru	Peds NB	Peds SB	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 06:00 AM																
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 12:15 PM																
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
% App. Total	0	0	0	0		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 04:15 PM																
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**	**1**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% App. Total	0	0	0	0		0	0	0	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.250

PRECISION
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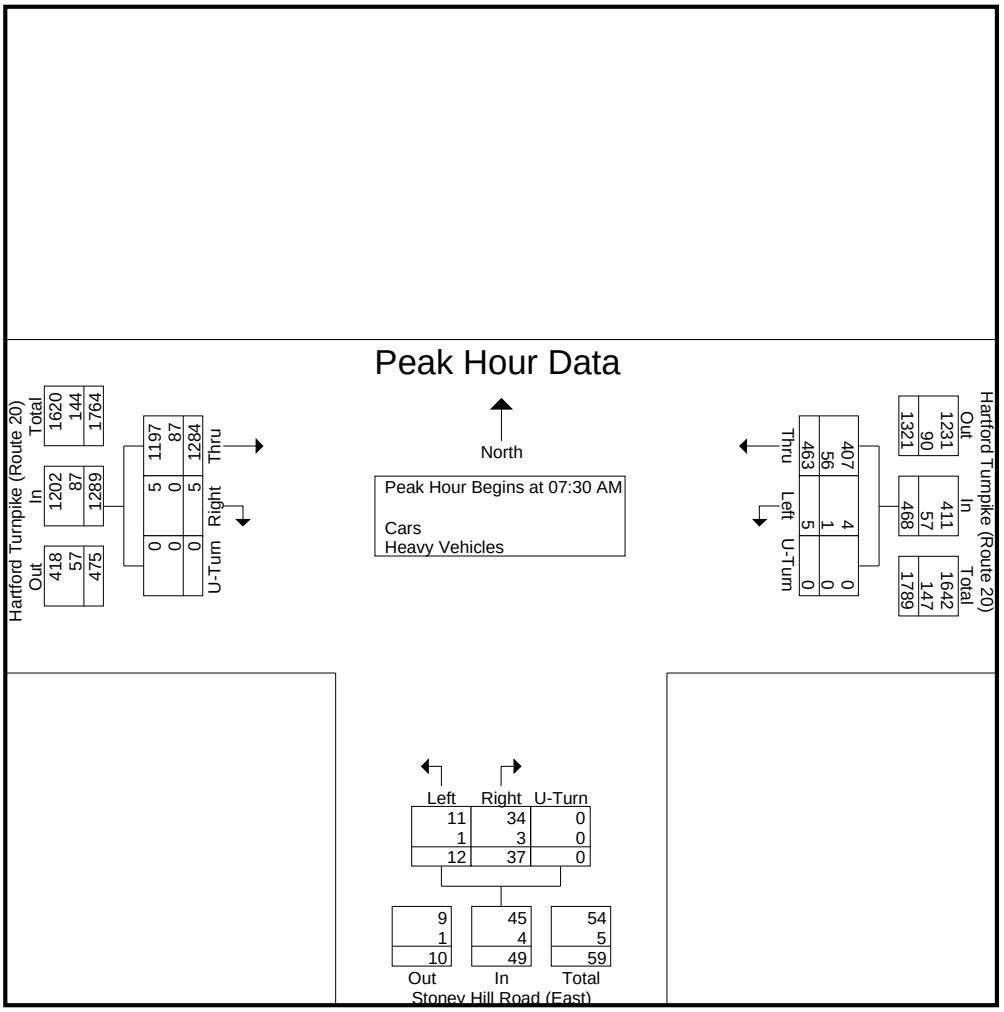
S: Stoney Hill Road (East)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	114	**3**	0	117	**10**	2	0	12	**2**	329	0	331	460
07:45 AM	**126**	1	0	**127**	8	**7**	0	**15**	1	**347**	0	**348**	**490**
08:00 AM	114	1	0	115	10	3	0	13	1	302	0	303	431
08:15 AM	109	0	0	109	9	0	0	9	1	306	0	307	425
Total Volume	463	5	0	468	37	12	0	49	5	1284	0	1289	1806
% App. Total	98.9	1.1	0		75.5	24.5	0		0.4	99.6	0		
PHF	.919	.417	.000	.921	.925	.429	.000	.817	.625	.925	.000	.926	.921
Cars	407	4	0	411	34	11	0	45	5	1197	0	1202	1658
% Cars	87.9	80.0	0	87.8	91.9	91.7	0	91.8	100	93.2	0	93.3	91.8
Heavy Vehicles	56	1	0	57	3	1	0	4	0	87	0	87	148
% Heavy Vehicles	12.1	20.0	0	12.2	8.1	8.3	0	8.2	0	6.8	0	6.7	8.2



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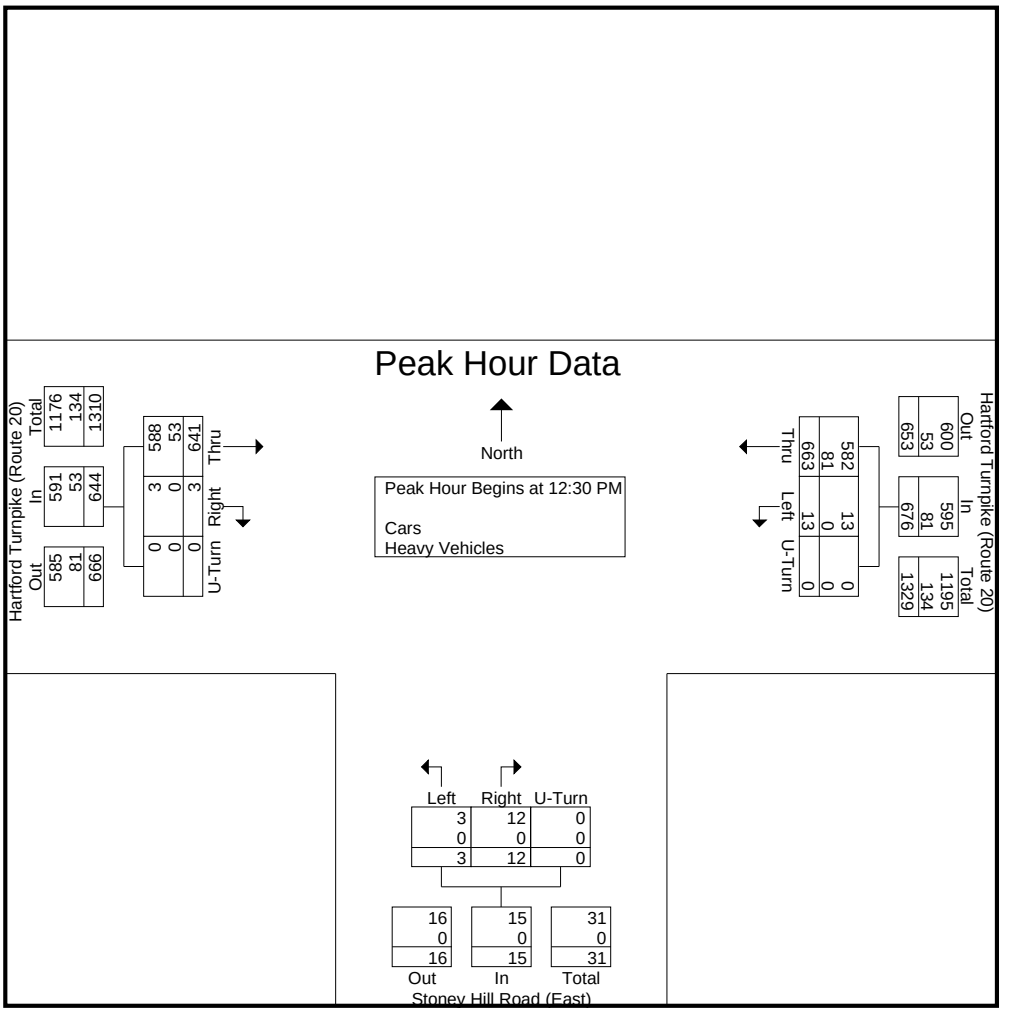
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 A
Site Code : TBA
Start Date : 1/7/2016
Page No : 2

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 12:30 PM													
12:30 PM	156	**6**	0	162	1	0	0	1	0	**175**	0	**175**	**338**
12:45 PM	169	4	0	173	**4**	**1**	0	**5**	**2**	156	0	158	336
01:00 PM	165	2	0	167	3	1	0	4	1	157	0	158	329
01:15 PM	**173**	1	0	**174**	4	1	0	5	0	153	0	153	332
Total Volume	663	13	0	676	12	3	0	15	3	641	0	644	1335
% App. Total	98.1	1.9	0		80	20	0		0.5	99.5	0		
PHF	.958	.542	.000	.971	.750	.750	.000	.750	.375	.916	.000	.920	.987
Cars	582	13	0	595	12	3	0	15	3	588	0	591	1201
% Cars	87.8	100	0	88.0	100	100	0	100	100	91.7	0	91.8	90.0
Heavy Vehicles	81	0	0	81	0	0	0	0	0	53	0	53	134
% Heavy Vehicles	12.2	0	0	12.0	0	0	0	0	0	8.3	0	8.2	10.0



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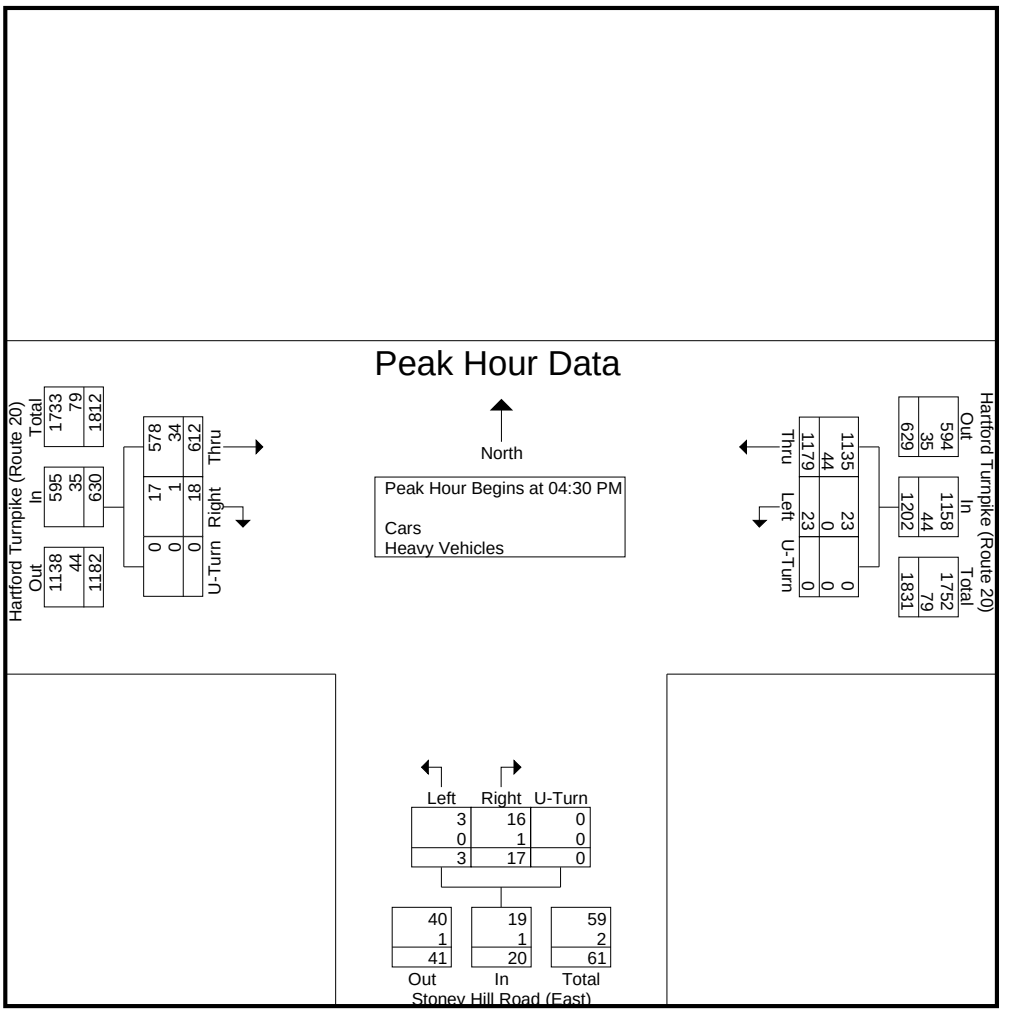
Page No : 3

	Hartford Turnpike (Route 20) From East				Stoney Hill Road (East) From South				Hartford Turnpike (Route 20) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	312	4	0	316	1	0	0	1	3	**162**	0	**165**	482
04:45 PM	267	6	0	273	4	**2**	0	6	**9**	154	0	163	442
05:00 PM	284	5	0	289	**6**	0	0	6	1	139	0	140	435
05:15 PM	**316**	**8**	0	**324**	6	1	0	**7**	5	157	0	162	**493**
Total Volume	1179	23	0	1202	17	3	0	20	18	612	0	630	1852
% App. Total	98.1	1.9	0		85	15	0		2.9	97.1	0		
PHF	.933	.719	.000	.927	.708	.375	.000	.714	.500	.944	.000	.955	.939
Cars	1135	23	0	1158	16	3	0	19	17	578	0	595	1772
% Cars	96.3	100	0	96.3	94.1	100	0	95.0	94.4	94.4	0	94.4	95.7
Heavy Vehicles	44	0	0	44	1	0	0	1	1	34	0	35	80
% Heavy Vehicles	3.7	0	0	3.7	5.9	0	0	5.0	5.6	5.6	0	5.6	4.3



PRECISION
D A T A
INDUSTRIES, LLC
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Email: datarequests@pdillc.com

N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
06:00 AM	0	0	0	0	1	54	0	0	2	0	2	0	0	159	1	0	219
06:15 AM	0	0	0	0	3	63	0	0	0	0	1	0	2	175	8	0	252
06:30 AM	0	0	0	0	4	65	0	0	0	0	4	0	2	263	5	0	343
06:45 AM	0	0	0	0	3	75	0	0	1	0	4	0	1	315	8	0	407
Total	0	0	0	0	11	257	0	0	3	0	11	0	5	912	22	0	1221
07:00 AM	0	0	0	0	2	104	1	0	3	0	3	0	0	272	6	0	391
07:15 AM	0	0	0	0	2	115	0	0	4	0	4	0	1	297	7	0	430
07:30 AM	1	0	0	0	4	116	0	0	5	0	11	0	2	344	7	0	490
07:45 AM	0	0	0	0	2	128	0	0	5	0	5	0	1	351	11	0	503
Total	1	0	0	0	10	463	1	0	17	0	23	0	4	1264	31	0	1814
08:00 AM	0	0	3	0	3	118	1	0	5	0	1	0	2	304	14	0	451
08:15 AM	0	0	0	0	2	112	1	0	8	0	11	0	3	302	3	0	442
08:30 AM	0	0	1	0	3	118	2	0	2	0	5	0	2	314	7	0	454
08:45 AM	0	0	0	0	3	136	1	0	1	0	3	0	2	256	3	0	405
Total	0	0	4	0	11	484	5	0	16	0	20	0	9	1176	27	0	1752
09:00 AM	0	0	0	0	3	111	0	0	1	0	1	0	2	162	7	0	287
09:15 AM	1	0	0	0	3	107	0	0	4	0	2	0	1	212	7	0	337
09:30 AM	1	0	0	0	2	111	1	0	4	0	0	0	1	201	4	0	325
09:45 AM	0	0	0	0	5	106	3	0	1	0	2	0	2	175	2	0	296
Total	2	0	0	0	13	435	4	0	10	0	5	0	6	750	20	0	1245
10:00 AM	1	0	0	0	4	119	0	0	2	0	4	0	0	157	4	0	291
10:15 AM	0	0	0	0	1	138	1	0	5	0	3	0	0	162	11	0	321
10:30 AM	0	0	0	0	2	145	0	0	2	0	2	0	2	147	4	0	304
10:45 AM	4	0	0	0	3	131	1	0	0	0	2	0	1	146	6	0	294
Total	5	0	0	0	10	533	2	0	9	0	11	0	3	612	25	0	1210
11:00 AM	1	0	0	0	3	121	1	0	1	0	3	0	3	159	5	0	297
11:15 AM	1	0	1	0	4	135	1	0	0	0	1	0	1	162	9	0	315
11:30 AM	1	0	1	0	2	140	0	0	0	0	4	0	3	151	4	0	306
11:45 AM	0	0	0	0	3	163	0	0	1	0	1	0	2	150	7	0	327
Total	3	0	2	0	12	559	2	0	2	0	9	0	9	622	25	0	1245
12:00 PM	0	0	1	0	4	158	0	1	0	0	1	0	3	119	2	0	289
12:15 PM	0	0	0	0	3	170	4	0	1	0	3	0	0	160	9	0	350
12:30 PM	1	0	1	0	3	157	0	0	0	0	2	0	3	184	5	0	356
12:45 PM	0	0	0	0	1	170	0	0	0	0	3	0	2	159	3	0	338
Total	1	0	2	0	11	655	4	1	1	0	9	0	8	622	19	0	1333
01:00 PM	4	0	0	0	1	171	0	0	0	0	1	0	4	154	8	0	343
01:15 PM	0	0	0	0	2	170	1	0	2	0	1	0	1	149	5	0	331
01:30 PM	0	0	0	0	4	163	0	0	1	0	0	0	3	130	9	0	310
01:45 PM	1	0	0	0	3	139	0	0	0	0	2	0	2	148	2	0	297
Total	5	0	0	0	10	643	1	0	3	0	4	0	10	581	24	0	1281
02:00 PM	1	0	0	0	3	175	0	0	0	0	1	0	1	146	7	0	334
02:15 PM	0	0	0	0	3	188	0	0	1	0	2	0	4	152	6	0	356
02:30 PM	0	0	0	0	5	184	0	0	2	0	3	0	3	192	6	0	395
02:45 PM	1	0	0	0	4	218	1	0	0	0	2	0	5	202	7	0	440
Total	2	0	0	0	15	765	1	0	3	0	8	0	13	692	26	0	1525
03:00 PM	0	0	0	0	3	227	1	0	4	0	2	0	6	154	5	0	402
03:15 PM	0	0	1	0	4	207	4	0	1	0	6	0	3	148	5	0	379
03:30 PM	0	0	1	0	2	286	1	0	1	0	1	0	5	157	4	0	458
03:45 PM	1	0	0	0	0	239	1	0	2	0	3	0	4	180	3	0	433
Total	1	0	2	0	9	959	7	0	8	0	12	0	18	639	17	0	1672

PRECISION
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N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Cars - Heavy Vehicles

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	0	0	0	3	260	0	0	0	0	1	0	3	156	2	0	425
04:15 PM	1	0	0	0	3	258	3	0	2	0	3	0	9	141	5	0	425
04:30 PM	0	0	0	0	4	302	0	0	2	0	1	0	5	163	3	0	480
04:45 PM	0	0	0	0	1	277	6	0	3	0	3	0	9	159	2	0	460
Total	1	0	0	0	11	1097	9	0	7	0	8	0	26	619	12	0	1790
05:00 PM	0	0	0	0	0	282	3	0	1	0	2	0	2	138	2	0	430
05:15 PM	1	0	0	0	1	323	1	0	3	0	4	0	7	158	1	0	499
05:30 PM	0	0	0	0	1	228	3	0	0	0	5	0	12	150	2	0	401
05:45 PM	0	0	0	0	0	244	4	0	1	1	6	0	8	179	3	0	446
Total	1	0	0	0	2	1077	11	0	5	1	17	0	29	625	8	0	1776
06:00 PM	1	0	0	0	1	239	0	0	2	0	4	0	8	144	3	0	402
06:15 PM	1	0	0	0	0	236	3	0	2	0	4	0	5	119	1	0	371
06:30 PM	0	0	0	0	1	187	3	0	2	0	3	0	9	133	1	0	339
06:45 PM	0	0	1	0	1	181	3	0	1	0	8	0	7	104	2	0	308
Total	2	0	1	0	3	843	9	0	7	0	19	0	29	500	7	0	1420
Grand Total	24	0	11	0	128	8770	56	1	91	1	156	0	169	9614	263	0	19284
Apprch %	68.6	0	31.4	0	1.4	97.9	0.6	0	36.7	0.4	62.9	0	1.7	95.7	2.6	0	
Total %	0.1	0	0.1	0	0.7	45.5	0.3	0	0.5	0	0.8	0	0.9	49.9	1.4	0	
Cars	23	0	10	0	89	8000	53	1	88	1	154	0	156	8733	193	0	17501
% Cars	95.8	0	90.9	0	69.5	91.2	94.6	100	96.7	100	98.7	0	92.3	90.8	73.4	0	90.8
Heavy Vehicles	1	0	1	0	39	770	3	0	3	0	2	0	13	881	70	0	1783
% Heavy Vehicles	4.2	0	9.1	0	30.5	8.8	5.4	0	3.3	0	1.3	0	7.7	9.2	26.6	0	9.2

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**1**	0	0	0	1	**4**	116	0	0	120	5	0	**11**	0	16	2	344	7	0	353	490
07:45 AM	0	0	0	0	0	2	**128**	0	0	**130**	5	0	5	0	10	1	**351**	11	0	**363**	**503**
08:00 AM	0	0	**3**	0	**3**	3	118	**1**	0	122	5	0	1	0	6	2	304	**14**	0	320	451
08:15 AM	0	0	0	0	0	2	112	1	0	115	**8**	0	11	0	**19**	**3**	302	3	0	308	442
Total Volume	1	0	3	0	4	11	474	2	0	487	23	0	28	0	51	8	1301	35	0	1344	1886
% App. Total	25	0	75	0		2.3	97.3	0.4	0		45.1	0	54.9	0		0.6	96.8	2.6	0		
PHF	.250	.000	.250	.000	.333	.688	.926	.500	.000	.937	.719	.000	.636	.000	.671	.667	.927	.625	.000	.926	.937
Cars	1	0	3	0	4	10	415	2	0	427	23	0	27	0	50	5	1208	32	0	1245	1726
% Cars	100	0	100	0	100	90.9	87.6	100	0	87.7	100	0	96.4	0	98.0	62.5	92.9	91.4	0	92.6	91.5
Heavy Vehicles	0	0	0	0	0	1	59	0	0	60	0	0	1	0	1	3	93	3	0	99	160
% Heavy Vehicles	0	0	0	0	0	9.1	12.4	0	0	12.3	0	0	3.6	0	2.0	37.5	7.1	8.6	0	7.4	8.5
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:15 PM																					
12:15 PM	0	0	0	0	0	**3**	170	**4**	0	**177**	**1**	0	**3**	0	**4**	0	160	**9**	0	169	350
12:30 PM	1	0	**1**	0	2	3	157	0	0	160	0	0	2	0	2	3	**184**	5	0	**192**	**356**
12:45 PM	0	0	0	0	0	1	170	0	0	171	0	0	3	0	3	2	159	3	0	164	338
01:00 PM	**4**	0	0	0	**4**	1	**171**	0	0	172	0	0	1	0	1	**4**	154	8	0	166	343
Total Volume	5	0	1	0	6	8	668	4	0	680	1	0	9	0	10	9	657	25	0	691	1387
% App. Total	83.3	0	16.7	0		1.2	98.2	0.6	0		10	0	90	0		1.3	95.1	3.6	0		
PHF	.313	.000	.250	.000	.375	.667	.977	.250	.000	.960	.250	.000	.750	.000	.625	.563	.893	.694	.000	.900	.974
Cars	5	0	1	0	6	4	590	4	0	598	1	0	9	0	10	9	588	17	0	614	1228
% Cars	100	0	100	0	100	50.0	88.3	100	0	87.9	100	0	100	0	100	100	89.5	68.0	0	88.9	88.5
Heavy Vehicles	0	0	0	0	0	4	78	0	0	82	0	0	0	0	0	0	69	8	0	77	159
% Heavy Vehicles	0	0	0	0	0	50.0	11.7	0	0	12.1	0	0	0	0	0	0	10.5	32.0	0	11.1	11.5

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N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 3

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	**4**	302	0	0	306	2	0	1	0	3	5	**163**	**3**	0	**171**	480
04:45 PM	0	0	0	0	0	1	277	**6**	0	284	**3**	0	3	0	6	**9**	159	2	0	170	460
05:00 PM	0	0	0	0	0	0	282	3	0	285	1	0	2	0	3	2	138	2	0	142	430
05:15 PM	**1**	0	0	0	**1**	1	**323**	1	0	**325**	3	0	**4**	0	**7**	7	158	1	0	166	**499**
Total Volume	1	0	0	0	1	6	1184	10	0	1200	9	0	10	0	19	23	618	8	0	649	1869
% App. Total	100	0	0	0		0.5	98.7	0.8	0		47.4	0	52.6	0		3.5	95.2	1.2	0		
PHF	.250	.000	.000	.000	.250	.375	.916	.417	.000	.923	.750	.000	.625	.000	.679	.639	.948	.667	.000	.949	.936
Cars	1	0	0	0	1	3	1150	10	0	1163	9	0	10	0	19	22	580	3	0	605	1788
% Cars	100	0	0	0	100	50.0	97.1	100	0	96.9	100	0	100	0	100	95.7	93.9	37.5	0	93.2	95.7
Heavy Vehicles	0	0	0	0	0	3	34	0	0	37	0	0	0	0	0	1	38	5	0	44	81
% Heavy Vehicles	0	0	0	0	0	50.0	2.9	0	0	3.1	0	0	0	0	0	4.3	6.1	62.5	0	6.8	4.3

N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

Groups Printed- Cars

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
06:00 AM	0	0	0	0	1	44	0	0	2	0	1	0	0	148	1	0	197
06:15 AM	0	0	0	0	3	41	0	0	0	0	1	0	1	163	7	0	216
06:30 AM	0	0	0	0	4	57	0	0	0	0	4	0	1	249	5	0	320
06:45 AM	0	0	0	0	3	66	0	0	1	0	4	0	0	300	8	0	382
Total	0	0	0	0	11	208	0	0	3	0	10	0	2	860	21	0	1115
07:00 AM	0	0	0	0	2	100	1	0	3	0	3	0	0	246	6	0	361
07:15 AM	0	0	0	0	2	108	0	0	3	0	4	0	0	276	7	0	400
07:30 AM	1	0	0	0	4	109	0	0	5	0	10	0	0	320	7	0	456
07:45 AM	0	0	0	0	2	119	0	0	5	0	5	0	1	325	11	0	468
Total	1	0	0	0	10	436	1	0	16	0	22	0	1	1167	31	0	1685
08:00 AM	0	0	3	0	3	98	1	0	5	0	1	0	2	277	12	0	402
08:15 AM	0	0	0	0	1	89	1	0	8	0	11	0	2	286	2	0	400
08:30 AM	0	0	1	0	2	98	1	0	2	0	5	0	2	284	6	0	401
08:45 AM	0	0	0	0	0	116	1	0	1	0	3	0	2	240	3	0	366
Total	0	0	4	0	6	401	4	0	16	0	20	0	8	1087	23	0	1569
09:00 AM	0	0	0	0	2	89	0	0	1	0	1	0	2	140	4	0	239
09:15 AM	1	0	0	0	3	92	0	0	4	0	2	0	1	182	2	0	287
09:30 AM	1	0	0	0	2	93	1	0	4	0	0	0	1	168	3	0	273
09:45 AM	0	0	0	0	3	86	3	0	1	0	2	0	2	145	1	0	243
Total	2	0	0	0	10	360	4	0	10	0	5	0	6	635	10	0	1042
10:00 AM	1	0	0	0	2	97	0	0	2	0	4	0	0	140	1	0	247
10:15 AM	0	0	0	0	0	115	1	0	4	0	3	0	0	148	7	0	278
10:30 AM	0	0	0	0	2	116	0	0	2	0	2	0	2	131	1	0	256
10:45 AM	3	0	0	0	3	110	1	0	0	0	2	0	1	131	4	0	255
Total	4	0	0	0	7	438	2	0	8	0	11	0	3	550	13	0	1036
11:00 AM	1	0	0	0	3	104	1	0	1	0	3	0	3	139	5	0	260
11:15 AM	1	0	1	0	2	113	1	0	0	0	1	0	1	142	5	0	267
11:30 AM	1	0	1	0	1	118	0	0	0	0	4	0	3	138	4	0	270
11:45 AM	0	0	0	0	3	142	0	0	1	0	1	0	2	130	4	0	283
Total	3	0	2	0	9	477	2	0	2	0	9	0	9	549	18	0	1080
12:00 PM	0	0	1	0	3	141	0	1	0	0	1	0	2	103	1	0	253
12:15 PM	0	0	0	0	2	156	4	0	1	0	3	0	0	150	8	0	324
12:30 PM	1	0	1	0	2	136	0	0	0	0	2	0	3	167	3	0	315
12:45 PM	0	0	0	0	0	151	0	0	0	0	3	0	2	137	2	0	295
Total	1	0	2	0	7	584	4	1	1	0	9	0	7	557	14	0	1187
01:00 PM	4	0	0	0	0	147	0	0	0	0	1	0	4	134	4	0	294
01:15 PM	0	0	0	0	2	151	1	0	2	0	1	0	1	132	5	0	295
01:30 PM	0	0	0	0	4	145	0	0	0	0	0	0	3	117	8	0	277
01:45 PM	1	0	0	0	3	121	0	0	0	0	2	0	2	132	1	0	262
Total	5	0	0	0	9	564	1	0	2	0	4	0	10	515	18	0	1128
02:00 PM	1	0	0	0	1	164	0	0	0	0	1	0	1	131	4	0	303
02:15 PM	0	0	0	0	3	168	0	0	1	0	2	0	3	139	3	0	319
02:30 PM	0	0	0	0	2	174	0	0	2	0	3	0	3	180	5	0	369
02:45 PM	1	0	0	0	2	202	0	0	0	0	2	0	5	184	5	0	401
Total	2	0	0	0	8	708	0	0	3	0	8	0	12	634	17	0	1392
03:00 PM	0	0	0	0	0	209	1	0	4	0	2	0	5	135	4	0	360
03:15 PM	0	0	0	0	2	196	4	0	1	0	6	0	3	127	2	0	341
03:30 PM	0	0	1	0	1	272	1	0	1	0	1	0	5	140	3	0	425
03:45 PM	1	0	0	0	0	222	0	0	2	0	3	0	3	157	3	0	391
Total	1	0	1	0	3	899	6	0	8	0	12	0	16	559	12	0	1517

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 2

Groups Printed- Cars

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	0	0	0	0	247	0	0	0	0	1	0	3	142	1	0	394
04:15 PM	1	0	0	0	2	251	3	0	2	0	3	0	9	132	5	0	408
04:30 PM	0	0	0	0	2	294	0	0	2	0	1	0	5	151	1	0	456
04:45 PM	0	0	0	0	0	263	6	0	3	0	3	0	8	149	0	0	432
Total	1	0	0	0	4	1055	9	0	7	0	8	0	25	574	7	0	1690
05:00 PM	0	0	0	0	0	274	3	0	1	0	2	0	2	130	1	0	413
05:15 PM	1	0	0	0	1	319	1	0	3	0	4	0	7	150	1	0	487
05:30 PM	0	0	0	0	1	217	3	0	0	0	5	0	12	138	2	0	378
05:45 PM	0	0	0	0	0	242	4	0	1	1	6	0	8	169	3	0	434
Total	1	0	0	0	2	1052	11	0	5	1	17	0	29	587	7	0	1712
06:00 PM	1	0	0	0	1	231	0	0	2	0	4	0	7	124	1	0	371
06:15 PM	1	0	0	0	0	233	3	0	2	0	4	0	5	109	1	0	358
06:30 PM	0	0	0	0	1	180	3	0	2	0	3	0	9	127	0	0	325
06:45 PM	0	0	1	0	1	174	3	0	1	0	8	0	7	99	0	0	294
Total	2	0	1	0	3	818	9	0	7	0	19	0	28	459	2	0	1348
Grand Total	23	0	10	0	89	8000	53	1	88	1	154	0	156	8733	193	0	17501
Apprch %	69.7	0	30.3	0	1.1	98.2	0.7	0	36.2	0.4	63.4	0	1.7	96.2	2.1	0	
Total %	0.1	0	0.1	0	0.5	45.7	0.3	0	0.5	0	0.9	0	0.9	49.9	1.1	0	

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	0	0	2	108	0	0	110	3	0	4	0	7	0	276	7	0	283	400
07:30 AM	**1**	0	0	0	1	**4**	109	0	0	113	**5**	0	**10**	0	**15**	0	320	7	0	327	456
07:45 AM	0	0	0	0	0	2	**119**	0	0	**121**	5	0	5	0	10	1	**325**	11	0	**337**	**468**
08:00 AM	0	0	**3**	0	**3**	3	98	**1**	0	102	5	0	1	0	6	**2**	277	**12**	0	291	402
Total Volume	1	0	3	0	4	11	434	1	0	446	18	0	20	0	38	3	1198	37	0	1238	1726
% App. Total	25	0	75	0		2.5	97.3	0.2	0		47.4	0	52.6	0		0.2	96.8	3	0		
PHF	.250	.000	.250	.000	.333	.688	.912	.250	.000	.921	.900	.000	.500	.000	.633	.375	.922	.771	.000	.918	.922
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:15 PM																					
12:15 PM	0	0	0	0	0	**2**	**156**	**4**	0	**162**	**1**	0	**3**	0	**4**	0	150	**8**	0	158	**324**
12:30 PM	1	0	**1**	0	2	2	136	0	0	138	0	0	2	0	2	3	**167**	3	0	**173**	315
12:45 PM	0	0	0	0	0	0	151	0	0	151	0	0	3	0	3	2	137	2	0	141	295
01:00 PM	**4**	0	0	0	**4**	0	147	0	0	147	0	0	1	0	1	**4**	134	4	0	142	294
Total Volume	5	0	1	0	6	4	590	4	0	598	1	0	9	0	10	9	588	17	0	614	1228
% App. Total	83.3	0	16.7	0		0.7	98.7	0.7	0		10	0	90	0		1.5	95.8	2.8	0		
PHF	.313	.000	.250	.000	.375	.500	.946	.250	.000	.923	.250	.000	.750	.000	.625	.563	.880	.531	.000	.887	.948
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	**2**	294	0	0	296	2	0	1	0	3	5	**151**	**1**	0	157	456
04:45 PM	0	0	0	0	0	0	263	**6**	0	269	**3**	0	3	0	6	**8**	149	0	0	157	432
05:00 PM	0	0	0	0	0	0	274	3	0	277	1	0	2	0	3	2	130	1	0	133	413
05:15 PM	**1**	0	0	0	**1**	1	**319**	1	0	**321**	3	0	**4**	0	**7**	7	150	1	0	**158**	**487**
Total Volume	1	0	0	0	1	3	1150	10	0	1163	9	0	10	0	19	22	580	3	0	605	1788
% App. Total	100	0	0	0		0.3	98.9	0.9	0		47.4	0	52.6	0		3.6	95.9	0.5	0		
PHF	.250	.000	.000	.000	.250	.375	.901	.417	.000	.906	.750	.000	.625	.000	.679	.688	.960	.750	.000	.957	.918

PRECISION
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N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Heavy Vehicles

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
06:00 AM	0	0	0	0	0	10	0	0	0	0	1	0	0	11	0	0	22
06:15 AM	0	0	0	0	0	22	0	0	0	0	0	0	1	12	1	0	36
06:30 AM	0	0	0	0	0	8	0	0	0	0	0	0	1	14	0	0	23
06:45 AM	0	0	0	0	0	9	0	0	0	0	0	0	1	15	0	0	25
Total	0	0	0	0	0	49	0	0	0	0	1	0	3	52	1	0	106
07:00 AM	0	0	0	0	0	4	0	0	0	0	0	0	0	26	0	0	30
07:15 AM	0	0	0	0	0	7	0	0	1	0	0	0	1	21	0	0	30
07:30 AM	0	0	0	0	0	7	0	0	0	0	1	0	2	24	0	0	34
07:45 AM	0	0	0	0	0	9	0	0	0	0	0	0	0	26	0	0	35
Total	0	0	0	0	0	27	0	0	1	0	1	0	3	97	0	0	129
08:00 AM	0	0	0	0	0	20	0	0	0	0	0	0	0	27	2	0	49
08:15 AM	0	0	0	0	1	23	0	0	0	0	0	0	1	16	1	0	42
08:30 AM	0	0	0	0	1	20	1	0	0	0	0	0	0	30	1	0	53
08:45 AM	0	0	0	0	3	20	0	0	0	0	0	0	0	16	0	0	39
Total	0	0	0	0	5	83	1	0	0	0	0	0	1	89	4	0	183
09:00 AM	0	0	0	0	1	22	0	0	0	0	0	0	0	22	3	0	48
09:15 AM	0	0	0	0	0	15	0	0	0	0	0	0	0	30	5	0	50
09:30 AM	0	0	0	0	0	18	0	0	0	0	0	0	0	33	1	0	52
09:45 AM	0	0	0	0	2	20	0	0	0	0	0	0	0	30	1	0	53
Total	0	0	0	0	3	75	0	0	0	0	0	0	0	115	10	0	203
10:00 AM	0	0	0	0	2	22	0	0	0	0	0	0	0	17	3	0	44
10:15 AM	0	0	0	0	1	23	0	0	1	0	0	0	0	14	4	0	43
10:30 AM	0	0	0	0	0	29	0	0	0	0	0	0	0	16	3	0	48
10:45 AM	1	0	0	0	0	21	0	0	0	0	0	0	0	15	2	0	39
Total	1	0	0	0	3	95	0	0	1	0	0	0	0	62	12	0	174
11:00 AM	0	0	0	0	0	17	0	0	0	0	0	0	0	20	0	0	37
11:15 AM	0	0	0	0	2	22	0	0	0	0	0	0	0	20	4	0	48
11:30 AM	0	0	0	0	1	22	0	0	0	0	0	0	0	13	0	0	36
11:45 AM	0	0	0	0	0	21	0	0	0	0	0	0	0	20	3	0	44
Total	0	0	0	0	3	82	0	0	0	0	0	0	0	73	7	0	165
12:00 PM	0	0	0	0	1	17	0	0	0	0	0	0	1	16	1	0	36
12:15 PM	0	0	0	0	1	14	0	0	0	0	0	0	0	10	1	0	26
12:30 PM	0	0	0	0	1	21	0	0	0	0	0	0	0	17	2	0	41
12:45 PM	0	0	0	0	1	19	0	0	0	0	0	0	0	22	1	0	43
Total	0	0	0	0	4	71	0	0	0	0	0	0	1	65	5	0	146
01:00 PM	0	0	0	0	1	24	0	0	0	0	0	0	0	20	4	0	49
01:15 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	17	0	0	36
01:30 PM	0	0	0	0	0	18	0	0	1	0	0	0	0	13	1	0	33
01:45 PM	0	0	0	0	0	18	0	0	0	0	0	0	0	16	1	0	35
Total	0	0	0	0	1	79	0	0	1	0	0	0	0	66	6	0	153
02:00 PM	0	0	0	0	2	11	0	0	0	0	0	0	0	15	3	0	31
02:15 PM	0	0	0	0	0	20	0	0	0	0	0	0	1	13	3	0	37
02:30 PM	0	0	0	0	3	10	0	0	0	0	0	0	0	12	1	0	26
02:45 PM	0	0	0	0	2	16	1	0	0	0	0	0	0	18	2	0	39
Total	0	0	0	0	7	57	1	0	0	0	0	0	1	58	9	0	133
03:00 PM	0	0	0	0	3	18	0	0	0	0	0	0	1	19	1	0	42
03:15 PM	0	0	1	0	2	11	0	0	0	0	0	0	0	21	3	0	38
03:30 PM	0	0	0	0	1	14	0	0	0	0	0	0	0	17	1	0	33
03:45 PM	0	0	0	0	0	17	1	0	0	0	0	0	1	23	0	0	42
Total	0	0	1	0	6	60	1	0	0	0	0	0	2	80	5	0	155

N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

PRECISION D A T A INDUSTRIES, LLC
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Email: datarequests@pdillc.com

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 2

Groups Printed- Heavy Vehicles

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	0	0	0	3	13	0	0	0	0	0	0	0	14	1	0	31
04:15 PM	0	0	0	0	1	7	0	0	0	0	0	0	0	9	0	0	17
04:30 PM	0	0	0	0	2	8	0	0	0	0	0	0	0	12	2	0	24
04:45 PM	0	0	0	0	1	14	0	0	0	0	0	0	1	10	2	0	28
Total	0	0	0	0	7	42	0	0	0	0	0	0	1	45	5	0	100
05:00 PM	0	0	0	0	0	8	0	0	0	0	0	0	0	8	1	0	17
05:15 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	8	0	0	12
05:30 PM	0	0	0	0	0	11	0	0	0	0	0	0	0	12	0	0	23
05:45 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	10	0	0	12
Total	0	0	0	0	0	25	0	0	0	0	0	0	0	38	1	0	64
06:00 PM	0	0	0	0	0	8	0	0	0	0	0	0	1	20	2	0	31
06:15 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	10	0	0	13
06:30 PM	0	0	0	0	0	7	0	0	0	0	0	0	0	6	1	0	14
06:45 PM	0	0	0	0	0	7	0	0	0	0	0	0	0	5	2	0	14
Total	0	0	0	0	0	25	0	0	0	0	0	0	1	41	5	0	72
Grand Total	1	0	1	0	39	770	3	0	3	0	2	0	13	881	70	0	1783
Apprch %	50	0	50	0	4.8	94.8	0.4	0	60	0	40	0	1.3	91.4	7.3	0	
Total %	0.1	0	0.1	0	2.2	43.2	0.2	0	0.2	0	0.1	0	0.7	49.4	3.9	0	

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 09:00 AM																					
09:00 AM	0	0	0	0	0	1	**22**	0	0	**23**	0	0	0	0	0	0	22	3	0	25	48
09:15 AM	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	0	30	**5**	0	**35**	50
09:30 AM	0	0	0	0	0	0	18	0	0	18	0	0	0	0	0	0	**33**	1	0	34	52
09:45 AM	0	0	0	0	0	**2**	20	0	0	22	0	0	0	0	0	0	30	1	0	31	**53**
Total Volume	0	0	0	0	0	3	75	0	0	78	0	0	0	0	0	0	115	10	0	125	203
% App. Total	0	0	0	0		3.8	96.2	0	0		0	0	0	0		0	92	8	0		
PHF	.000	.000	.000	.000	.000	.375	.852	.000	.000	.848	.000	.000	.000	.000	.000	.000	.871	.500	.000	.893	.958
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 10:00 AM																					
10:00 AM	0	0	0	0	0	**2**	22	0	0	24	0	0	0	0	0	0	**17**	3	0	**20**	44
10:15 AM	0	0	0	0	0	1	23	0	0	24	**1**	0	0	0	**1**	0	14	**4**	0	18	43
10:30 AM	0	0	0	0	0	0	**29**	0	0	**29**	0	0	0	0	0	0	16	3	0	19	**48**
10:45 AM	**1**	0	0	0	**1**	0	21	0	0	21	0	0	0	0	0	0	15	2	0	17	39
Total Volume	1	0	0	0	1	3	95	0	0	98	1	0	0	0	1	0	62	12	0	74	174
% App. Total	100	0	0	0		3.1	96.9	0	0		100	0	0	0		0	83.8	16.2	0		
PHF	.250	.000	.000	.000	.250	.375	.819	.000	.000	.845	.250	.000	.000	.000	.250	.000	.912	.750	.000	.925	.906
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	0	0	0	0	**3**	**18**	0	0	**21**	0	0	0	0	0	**1**	19	1	0	21	**42**
03:15 PM	0	0	**1**	0	**1**	2	11	0	0	13	0	0	0	0	0	0	21	**3**	0	**24**	38
03:30 PM	0	0	0	0	0	1	14	0	0	15	0	0	0	0	0	0	17	1	0	18	33
03:45 PM	0	0	0	0	0	0	17	**1**	0	18	0	0	0	0	0	1	**23**	0	0	24	42
Total Volume	0	0	1	0	1	6	60	1	0	67	0	0	0	0	0	2	80	5	0	87	155
% App. Total	0	0	100	0		9	89.6	1.5	0		0	0	0	0		2.3	92	5.7	0		
PHF	.000	.000	.250	.000	.250	.500	.833	.250	.000	.798	.000	.000	.000	.000	.000	.500	.870	.417	.000	.906	.923

PRECISION
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E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

Groups Printed- Peds and Bicycles

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	Peds EB	Peds WB	Right	Thru	Left	Peds SB	Peds NB	Right	Thru	Left	Peds WB	Peds EB	Right	Thru	Left	Peds NB	Peds SB	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PRECISION
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INDUSTRIES, LLC
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Office: 508.481.3999 Fax: 508.545.1234
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N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016

Groups Printed- Peds and Bicycles

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	Peds EB	Peds WB	Right	Thru	Left	Peds SB	Peds NB	Right	Thru	Left	Peds WB	Peds EB	Right	Thru	Left	Peds NB	Peds SB	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	3
Apprch %	0	0	0	0	100	0	0	0	0	0	0	0	0	100	0	0	0	0	0	100	
Total %	0	0	0	0	33.3	0	0	0	0	0	0	0	0	33.3	0	0	0	0	0	33.3	

	TriState Truck Driveway From North						Hartford Turnpike (Route 20) From East						Stoney Hill Road (West) From South						Hartford Turnpike (Route 20) From West						
Start Time	Right	Thru	Left	Peds EB	Peds WB	App. Total	Right	Thru	Left	Peds SB	Peds NB	App. Total	Right	Thru	Left	Peds WB	Peds EB	App. Total	Right	Thru	Left	Peds NB	Peds SB	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 08:00 AM																									
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	**1**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	100	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.250
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 12:45 PM																									
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1**	**1**
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
% App. Total	0	0	0	0	100		0	0	0	0	0		0	0	0	0	0		0	0	0	0	100		
PHF	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.500
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 02:00 PM																									
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

PRECISION DATA INDUSTRIES, LLC
P.O.Box 301 Berlin, MA 01503
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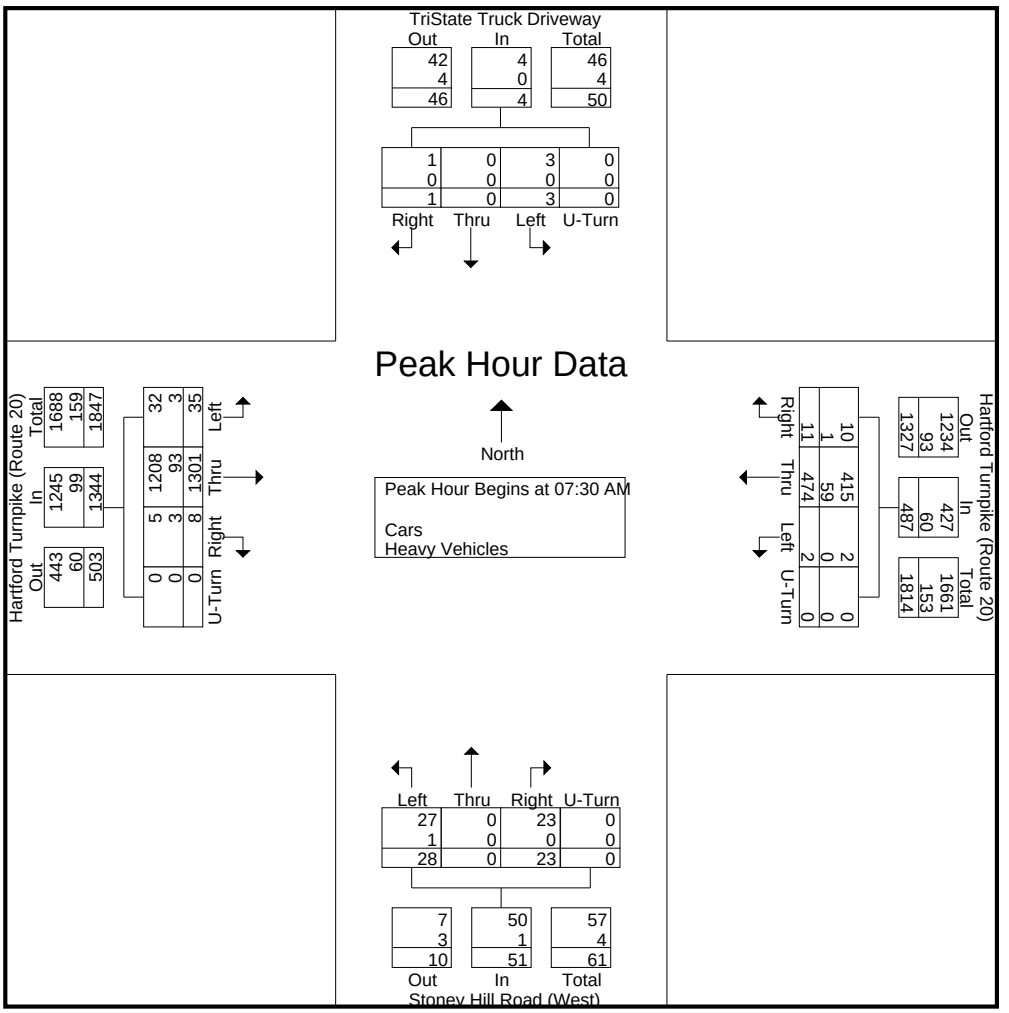
File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 1

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**1**	0	0	0	1	**4**	116	0	0	120	5	0	**11**	0	16	2	344	7	0	353	490
07:45 AM	0	0	0	0	0	2	**128**	0	0	**130**	5	0	5	0	10	1	**351**	11	0	**363**	**503**
08:00 AM	0	0	**3**	0	**3**	3	118	**1**	0	122	5	0	1	0	6	2	304	**14**	0	320	451
08:15 AM	0	0	0	0	0	2	112	1	0	115	**8**	0	11	0	**19**	**3**	302	3	0	308	442
Total Volume	1	0	3	0	4	11	474	2	0	487	23	0	28	0	51	8	1301	35	0	1344	1886
% App. Total	25	0	75	0		2.3	97.3	0.4	0		45.1	0	54.9	0		0.6	96.8	2.6	0		
PHF	.250	.000	.250	.000	.333	.688	.926	.500	.000	.937	.719	.000	.636	.000	.671	.667	.927	.625	.000	.926	.937
Cars	1	0	3	0	4	10	415	2	0	427	23	0	27	0	50	5	1208	32	0	1245	1726
% Cars	100	0	100	0	100	90.9	87.6	100	0	87.7	100	0	96.4	0	98.0	62.5	92.9	91.4	0	92.6	91.5
Heavy Vehicles	0	0	0	0	0	1	59	0	0	60	0	0	1	0	1	3	93	3	0	99	160
% Heavy Vehicles	0	0	0	0	0	9.1	12.4	0	0	12.3	0	0	3.6	0	2.0	37.5	7.1	8.6	0	7.4	8.5



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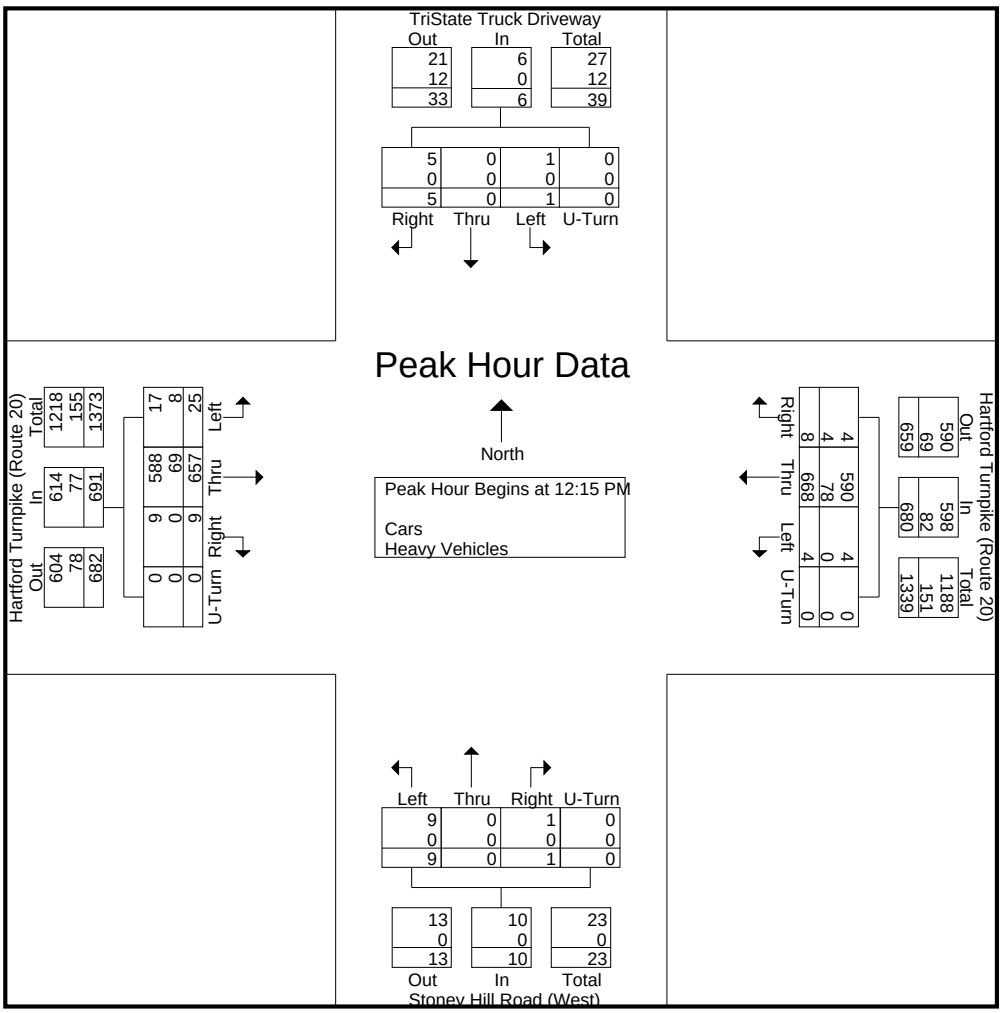
N/S: TriState Dr/Stoney Hill Road (West)
E/W: Hartford Turnpike (Route 20)
City, State: Shrewsbury, MA
Client: Tetra Tech/ N. Doherty

File Name : 164876 B
Site Code : TBA
Start Date : 1/7/2016
Page No : 2

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:15 PM																					
12:15 PM	0	0	0	0	0	**3**	170	**4**	0	**177**	**1**	0	**3**	0	**4**	0	160	**9**	0	169	350
12:30 PM	1	0	**1**	0	2	3	157	0	0	160	0	0	2	0	2	3	**184**	5	0	**192**	**356**
12:45 PM	0	0	0	0	0	1	170	0	0	171	0	0	3	0	3	2	159	3	0	164	338
01:00 PM	**4**	0	0	0	**4**	1	**171**	0	0	172	0	0	1	0	1	**4**	154	8	0	166	343
Total Volume	5	0	1	0	6	8	668	4	0	680	1	0	9	0	10	9	657	25	0	691	1387
% App. Total	83.3	0	16.7	0		1.2	98.2	0.6	0		10	0	90	0		1.3	95.1	3.6	0		
PHF	.313	.000	.250	.000	.375	.667	.977	.250	.000	.960	.250	.000	.750	.000	.625	.563	.893	.694	.000	.900	.974
Cars	5	0	1	0	6	4	590	4	0	598	1	0	9	0	10	9	588	17	0	614	1228
% Cars	100	0	100	0	100	50.0	88.3	100	0	87.9	100	0	100	0	100	100	89.5	68.0	0	88.9	88.5
Heavy Vehicles	0	0	0	0	0	4	78	0	0	82	0	0	0	0	0	0	69	8	0	77	159
% Heavy Vehicles	0	0	0	0	0	50.0	11.7	0	0	12.1	0	0	0	0	0	0	10.5	32.0	0	11.1	11.5



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City, State: Shrewsbury, MA
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File Name : 164876 B
Site Code : TBA
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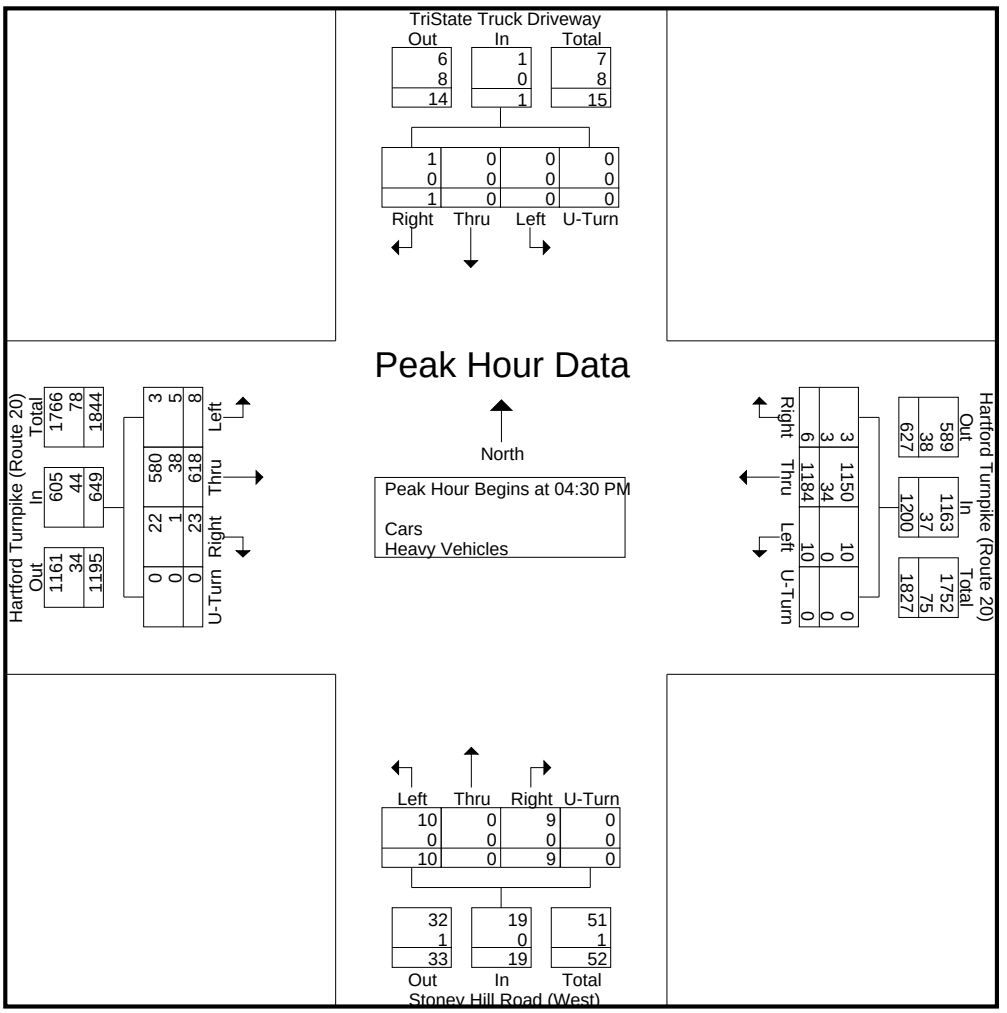
Page No : 3

	TriState Truck Driveway From North					Hartford Turnpike (Route 20) From East					Stoney Hill Road (West) From South					Hartford Turnpike (Route 20) From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	**4**	302	0	0	306	2	0	1	0	3	5	**163**	**3**	0	**171**	480
04:45 PM	0	0	0	0	0	1	277	**6**	0	284	**3**	0	3	0	6	**9**	159	2	0	170	460
05:00 PM	0	0	0	0	0	0	282	3	0	285	1	0	2	0	3	2	138	2	0	142	430
05:15 PM	**1**	0	0	0	**1**	1	**323**	1	0	**325**	3	0	**4**	0	**7**	7	158	1	0	166	**499**
Total Volume	1	0	0	0	1	6	1184	10	0	1200	9	0	10	0	19	23	618	8	0	649	1869
% App. Total	100	0	0	0		0.5	98.7	0.8	0		47.4	0	52.6	0		3.5	95.2	1.2	0		
PHF	.250	.000	.000	.000	.250	.375	.916	.417	.000	.923	.750	.000	.625	.000	.679	.639	.948	.667	.000	.949	.936
Cars	1	0	0	0	1	3	1150	10	0	1163	9	0	10	0	19	22	580	3	0	605	1788
% Cars	100	0	0	0	100	50.0	97.1	100	0	96.9	100	0	100	0	100	95.7	93.9	37.5	0	93.2	95.7
Heavy Vehicles	0	0	0	0	0	3	34	0	0	37	0	0	0	0	0	1	38	5	0	44	81
% Heavy Vehicles	0	0	0	0	0	50.0	2.9	0	0	3.1	0	0	0	0	0	4.3	6.1	62.5	0	6.8	4.3



Massachusetts Highway Department

307: Monthly Hourly Volume for January 2012

Location ID:	**307**	**Seasonal Factor Group:**	**U3**
County:	**WORCESTER**	**Daily Factor Group:**	
Funcationl Class	**3**	**Axle Factor Group:**	**U3**
Location:	**BOSTON WORCESTER TURNPIKE**	**Growth Factor Group:**	

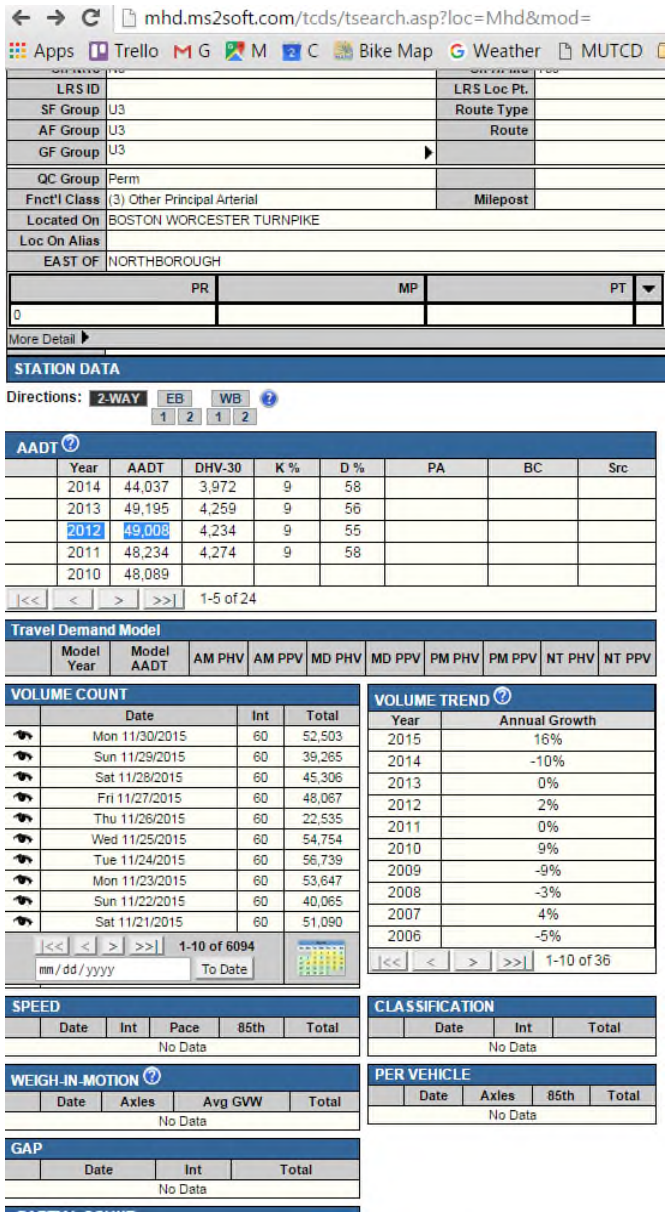
	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	TOTAL	
1																										Sun
2																										Mon
3																										Tues
4	346	360	269	151	271	853	2145	3342	3574	2916	2440	2729	3197	3253	3235	3443	3760	4096	3257	2356	1629	1333	894	576	50425	Wed
5	308	159	165	140	259	804	2110	3317	3746	2854	2491	2823	3345	3110	3251	3653	4004	3882	3170	2376	1642	1354	890	595	50448	Thur
6	326	189	199	141	246	739	1992	3204	3725	2863	2585	2868	3397	3421	3478	3863	4045	4092	3553	2518	1885	1714	1223	922	53188	Fri
7	485	295	227	117	191	332	722	1195	1648	2171	2714	3276	3610	3761	3758	3866	3583	3159	2901	2336	1721	1527	1204	928	45727	Sat
8	476	273	171	75	96	193	445	627	910	1303	1933	2471	3065	3227	3282	3329	2931	2474	1950	1386	1107	814	564	397	33499	Sun
9	204	111	108	114	255	848	2189	3424	3789	2740	2453	2633	3100	3082	3081	3569	3931	3889	3178	2139	1521	1147	820	537	48862	Mon
10	257	147	152	130	269	812	2070	3478	3824	2763	2470	2672	3100	3028	3326	3542	3924	3799	3226	2187	1668	1259	895	596	49594	Tues
11	281	147	176	115	232	832	2102	3366	3515	2998	2644	2767	3356	3257	3178	3719	3947	3990	3295	2402	1773	1419	915	633	51059	Wed
12	293	143	198	143	278	804	1892	3003	3105	2707	2199	2264	2587	2630	2707	3060	3591	3800	3023	2080	1641	1282	868	623	44921	Thur
13	336	193	156	131	256	764	1880	3248	3690	2887	2478	2974	3519	3414	3534	3802	4082	3980	3465	2473	1863	1560	1170	838	52693	Fri
14	514	280	196	99	153	306	668	1212	1667	2213	2909	3481	3731	3803	3979	3995	3477	3057	2590	1983	1264	1159	895	1034	44665	Sat
15	702	351	233	107	96	236	448	626	936	1345	1840	2415	2983	3117	3120	3023	2736	2614	2180	1481	1366	917	744	555	34171	Sun
16	282	128	175	98	223	684	1472	2366	2644	2416	2331	2818	3418	3478	3584	3819	3541	3624	2828	2020	1363	1001	787	529	45629	Mon
17	328	175	187	186	271	785	1984	3080	3521	2710	2436	2529	3025	2891	3230	3408	3761	3847	3097	2120	1502	1193	811	524	47601	Tues
18	272	142	168	120	272	862	2094	3405	3735	2982	2481	2774	3257	3092	3177	3650	3813	4054	3330	2320	1683	1328	833	636	50480	Wed
19	307	177	217	154	457	892	2226	3518	3909	2975	2532	2820	3320	3148	3217	3678	3895	4058	3225	2429	1761	1360	906	684	51865	Thur
20	393	222	251	196	278	792	1880	3143	3515	2797	2394	2761	3499	3303	3297	3750	4015	4097	3610	2753	1968	1611	1271	892	52688	Fri
21	536	318	215	117	140	332	690	1147	1600	1524	1728	1729	1750	1666	1911	1973	2139	2095	2000	1631	1261	1157	979	783	29421	Sat
22	488	273	297	100	110	196	437	688	1129	1503	2127	2736	3219	3174	3135	2580	1876	1536	1569	1328	1117	752	551	446	31367	Sun
23	197	107	105	122	238	738	2009	3236	3746	2717	2278	2575	3022	2831	2868	3372	3619	3925	2978	2072	1588	1122	737	551	46753	Mon
24	256	137	136	124	243	814	2170	3434	3730	2840	2490	2715	3266	3000	3154	3516	3837	4098	3214	2220	1665	1281	834	498	49672	Tues
25	294	134	158	138	233	808	2081	3388	3772	2831	2535	2789	3284	3136	3200	3641	3794	3992	3242	2298	1730	1418	882	601	50379	Wed
26	295	139	176	136	238	802	2166	3348	3799	2936	2529	2836	3362	3116	3178	3739	3967	3885	3299	2356	1668	1353	901	646	50870	Thur
27	324	207	168	149	232	807	1970	3165	3615	2769	2548	2751	3248	3099	3256	3632	3879	3906	3494	2592	1858	1563	1243	1051	51526	Fri
28	447	301	206	118	133	299	732	1219	1805	2212	2811	3413	3846	3978	3869	4082	3607	3256	3079	2558	1888	1617	1245	1040	47761	Sat
29	539	310	191	115	83	159	403	684	964	1393	2015	2612	3227	3466	3504	3485	3264	2797	2217	1590	1055	901	678	493	36145	Sun
30	166	97	92	109	233	790	2102	3444	3627	2618	2295	2574	3087	2825	2968	3386	3847	4054	2960	2087	1588	1178	798	586	47511	Mon
31	228	149	156	120	251	866	2060	3462	3638	2878	2443	2705	3261	3026	3120	3559	3830	4122	3138	2259	1639	1310	933	608	49761	Tues

Source: http://mhd.ms2soft.com/tcds/tsearch.asp?loc=Mhd&mod=tcds

Jan MADT	
Sat Ave.	41894
Sun. Ave.	33796
Mon. Ave.	47189
Tues. Ave.	49157
Wed. Ave.	50586
Thurs. Ave.	49526
Fri. Ave.	52524
Monthy Ave.	**46381**

AADT MassDOT	**49008**

Adj. Required	**1.05663**



The Pointe at Hill Farm

- **Trip Generation**
- **Trip Distribution**

PROPOSED RESIDENTIAL DEVELOPMENTS - POINT AT HILL FARMS

Land Use Code 220 - Apartment						Size: 180		DWELLING UNITS
Time Period	R^2 Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
Weekday Daily	0.87	Equation	T=6.06(x)+123.56	6.65	50%	607	607	1214
AM Street Peak Hour	0.83	Equation	T=.49(x)+3.73	0.51	20%	18	74	92
PM Street Peak Hour	0.77	Equation	T=.55(x)+17.65	0.62	65%	76	41	117
Saturday Daily	0.85	Equation	T=7.85(x)-256.19	6.39	50%	579	578	1157
Saturday Peak Hour of Generator	0.56	Rate	T=.41(x)+19.23	0.52	54%	51	43	94
Sunday Daily	0.82	Equation	T=6.42(x)-101.12	5.86	50%	527	527	1054
Sunday Peak Hour of Generator		Rate		0.51	50%	46	46	92

Note: If R^2 is greater than or equal to 0.75 the equation is used to calculate trips, otherwise the rate is used.
Source: *Trip Generation*, *Ninth Edition*, (Institute of Transportation Engineers, 2012).

Land Use Code 220 - Apartment						Size: 100		DWELLING UNITS
Time Period	R^2 Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
Weekday Daily	0.87	Equation	T=6.06(x)+123.56	6.65	50%	365	365	730
AM Street Peak Hour	0.83	Equation	T=.49(x)+3.73	0.51	20%	11	42	53
PM Street Peak Hour	0.77	Equation	T=.55(x)+17.65	0.62	65%	47	26	73
Saturday Daily	0.85	Equation	T=7.85(x)-256.19	6.39	50%	265	264	529
Saturday Peak Hour of Generator	0.56	Rate	T=.41(x)+19.23	0.52	54%	28	24	52
Sunday Daily	0.82	Equation	T=6.42(x)-101.12	5.86	50%	271	270	541
Sunday Peak Hour of Generator		Rate		0.51	50%	26	25	51

Note: If R^2 is greater than or equal to 0.75 the equation is used to calculate trips, otherwise the rate is used.
Source: *Trip Generation*, *Ninth Edition*, (Institute of Transportation Engineers, 2012).

	In	Out	Total
Weekday Daily	972	972	1944
AM Street Peak Hour	29	116	145
PM Street Peak Hour	123	67	190

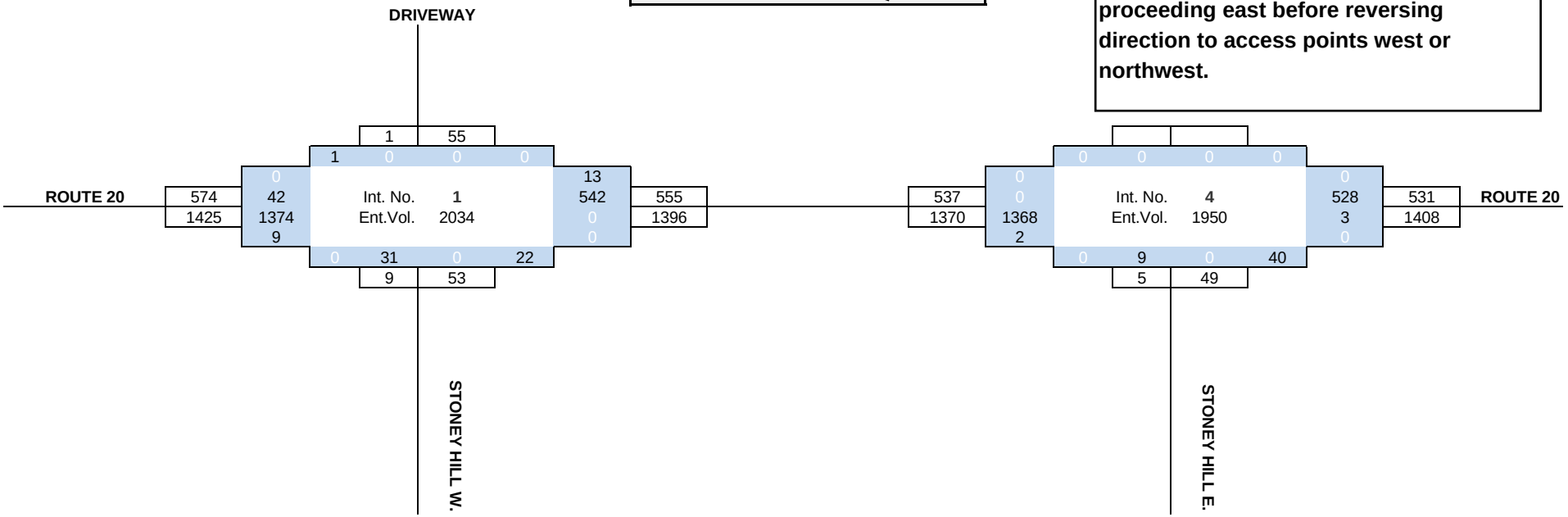
Nov. 2014

Sheet	Column	Description
Data	2	2014 EX AM RAW VOL

Inbound	From West	From East	Total
In	11	3	14
Percent	79%	21%	
Outbound	To West	To East	Total
Out	40	62	102
Percent	39%	61%	

PM inbound from East is 43% and US Census Journey to Work indicates portion to/from east at 44%.

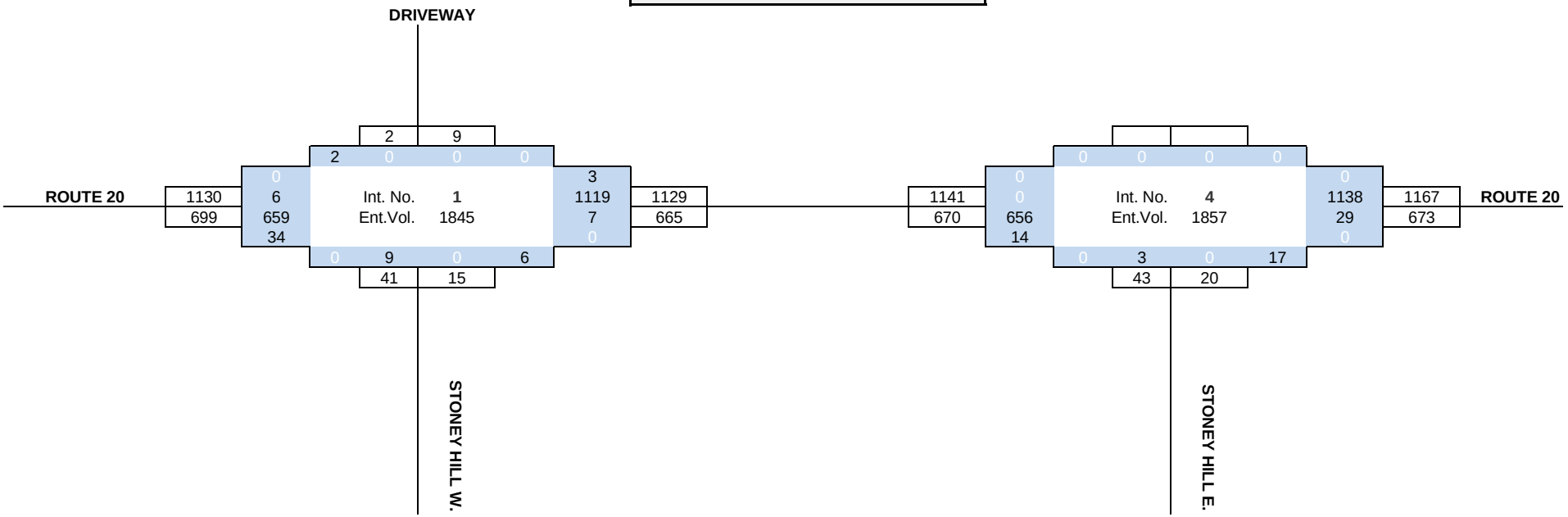
As reported during 12/28/15 ZBA hearing, Stoney Hill residents are turning right and proceeding east before reversing direction to access points west or northwest.



Nov. 2014

Sheet	Column	Description
Data	5	2014 EX PM RAW VOL

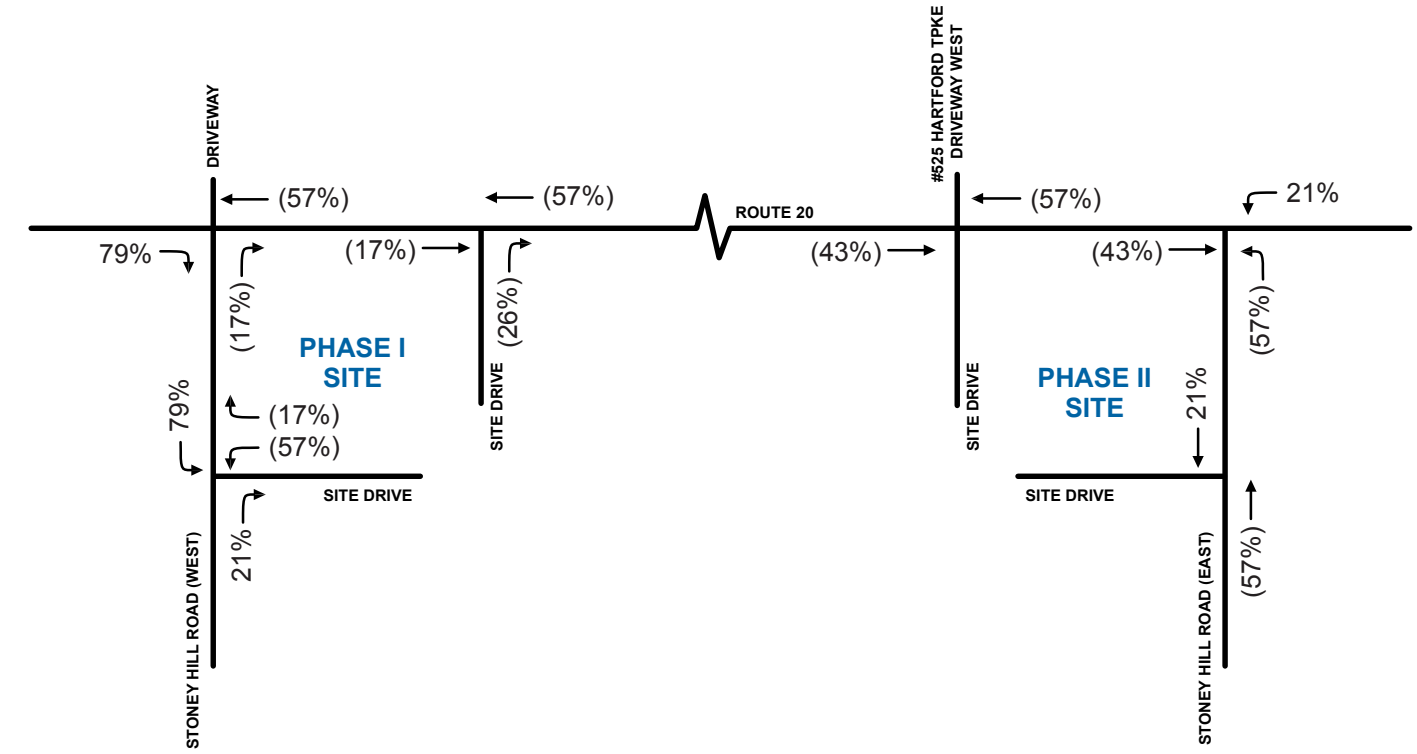
Inbound	From West	From East	Total
In	48	36	84
Percent	57%	43%	
Outbound	**To West**	**To East**	**Total**
Out	12	23	35
Percent	34%	66%	



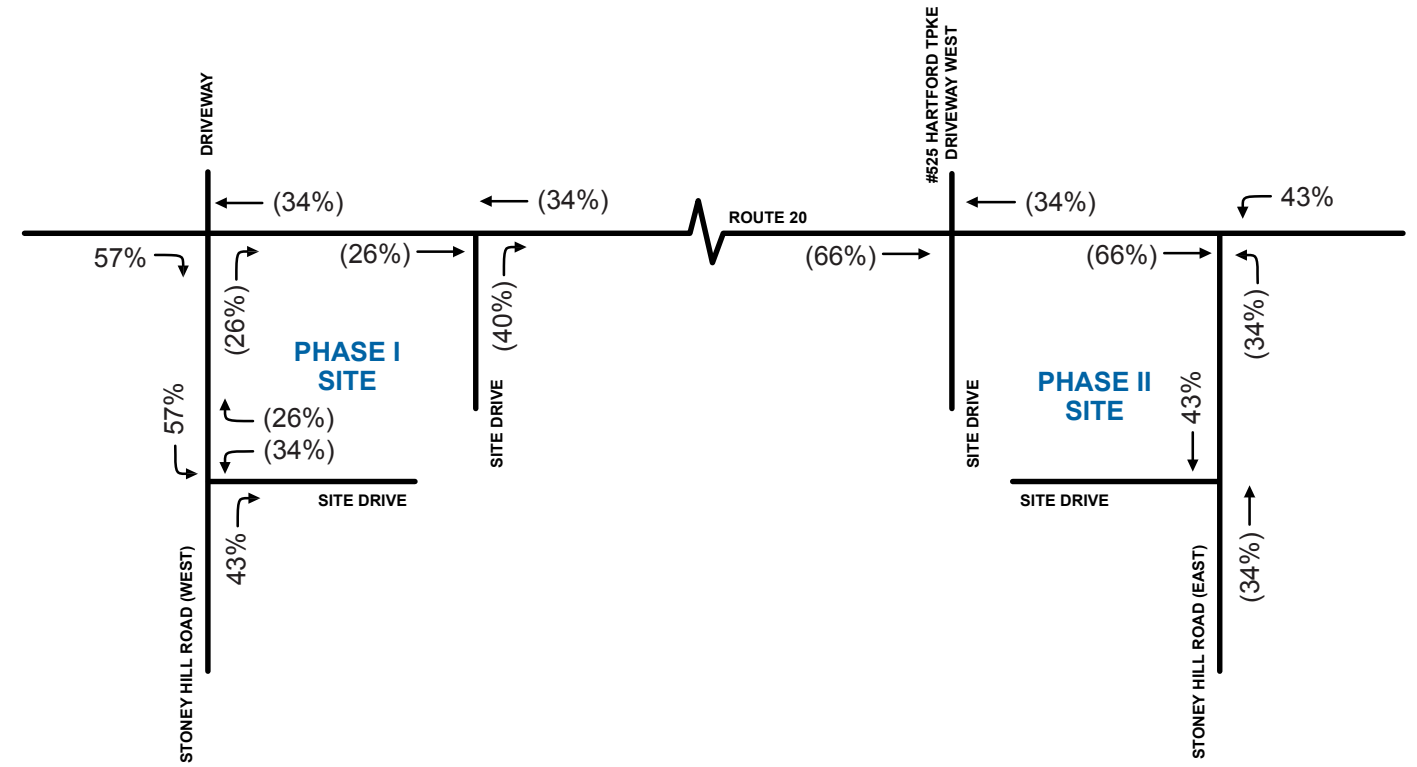
THE POINTE AT HILLS FARM - SHREWSBURY
GRAVITY MODEL FOR TRIP DISTRIBUTION

City/Town of Workers	STATE	No. of commuters from Shrewsbury*	Portion of commuters	RT. 140 (TO/FROM SOUTH)	RT. 20 (TO/FROM WEST)	GRAFTON ST (FROM N.WEST)	RT. 140 (TO/FROM NORTH)	RT. 20 (TO/FROM EAST)	CENTECH BLVD. (TO/FROM S.EAST)
AUBURN	Massachusetts	235	1.35%		100%				
BARRE	Massachusetts	19	0.11%		95%		5%		
BERLIN	Massachusetts	25	0.14%				25%	75%	
BOYLSTON	Massachusetts	135	0.78%				70%	30%	
CHARLTON	Massachusetts	10	0.06%		100%				
DUDLEY	Massachusetts	15	0.09%		100%				
EAST BROOKFIELD	Massachusetts	10	0.06%		100%				
GRAFTON	Massachusetts	184	1.06%	90%				5%	5%
HARDWICK	Massachusetts	10	0.06%		100%				
HOLDEN	Massachusetts	44	0.25%		50%		50%		
LEICESTER	Massachusetts	45	0.26%		100%				
MILLBURY	Massachusetts	160	0.92%	50%	50%				
MILFORD	Massachusetts	250	1.44%	50%				50%	
NORTHBRIDGE	Massachusetts	45	0.26%	90%	10%				
NORTHBOROUGH	Massachusetts	470	2.70%				20%	80%	
OXFORD	Massachusetts	24	0.14%		100%				
PAXTON	Massachusetts	60	0.34%		80%		20%		
RUTLAND	Massachusetts	10	0.06%		65%		35%		
SHREWSBURY	Massachusetts	3,150	18.11%		29%	1%	50%	20%	
SOUTHBRIDGE	Massachusetts	110	0.63%		100%				
SPENCER	Massachusetts	80	0.46%		100%				
STURBRIDGE	Massachusetts	30	0.17%		100%				
SUTTON	Massachusetts	65	0.37%	50%	50%				
UPTON	Massachusetts	45	0.26%	65%				35%	
UXBRIDGE	Massachusetts	15	0.09%	75%	25%				
WEBSTER	Massachusetts	15	0.09%		100%				
WEST BOYLSTON	Massachusetts	65	0.37%		25%		75%		
WESTBOROUGH	Massachusetts	1,590	9.14%					50%	50%
WORCESTER	Massachusetts	3,795	21.81%		70%		30%		
WORCESTER COUNTY, NORTH OF CMI	Massachusetts	348	2.00%		40%		60%		
Mass, East of Worcester County	Massachusetts	5,946	34.18%	2%	3%		15%	80%	
Mass, West of Worcester County	Massachusetts	130	0.75%		100%				
RHODE ISLAND	Rhodel Island	84	0.48%		50%		40%	10%	
CONNECTICUT	Connecticut	65	0.37%		100%				
NEW YORK	New York	10	0.06%		100%				
NEW HAMPSHIRE	New Hampshire	15	0.09%				50%	50%	
MAINE	Maine	15	0.09%				50%	50%	
Remaining U.S.	Remaining U.S.	74	0.43%		100%				
TOTAL		**17,398**	**100%**	**3.47%**	**28.88%**	**0.18%**	**23.82%**	**39.03%**	**4.62%**
				3%	**28%**	**1%**	**24%**	**39%**	**5%**
	SAY:			**56% TO/FROM THE WEST**				**44% TO/FROM THE EAST**	

**Source: Central Mass Regional Planning Commission*



AM Peak Hour



PM Peak Hour

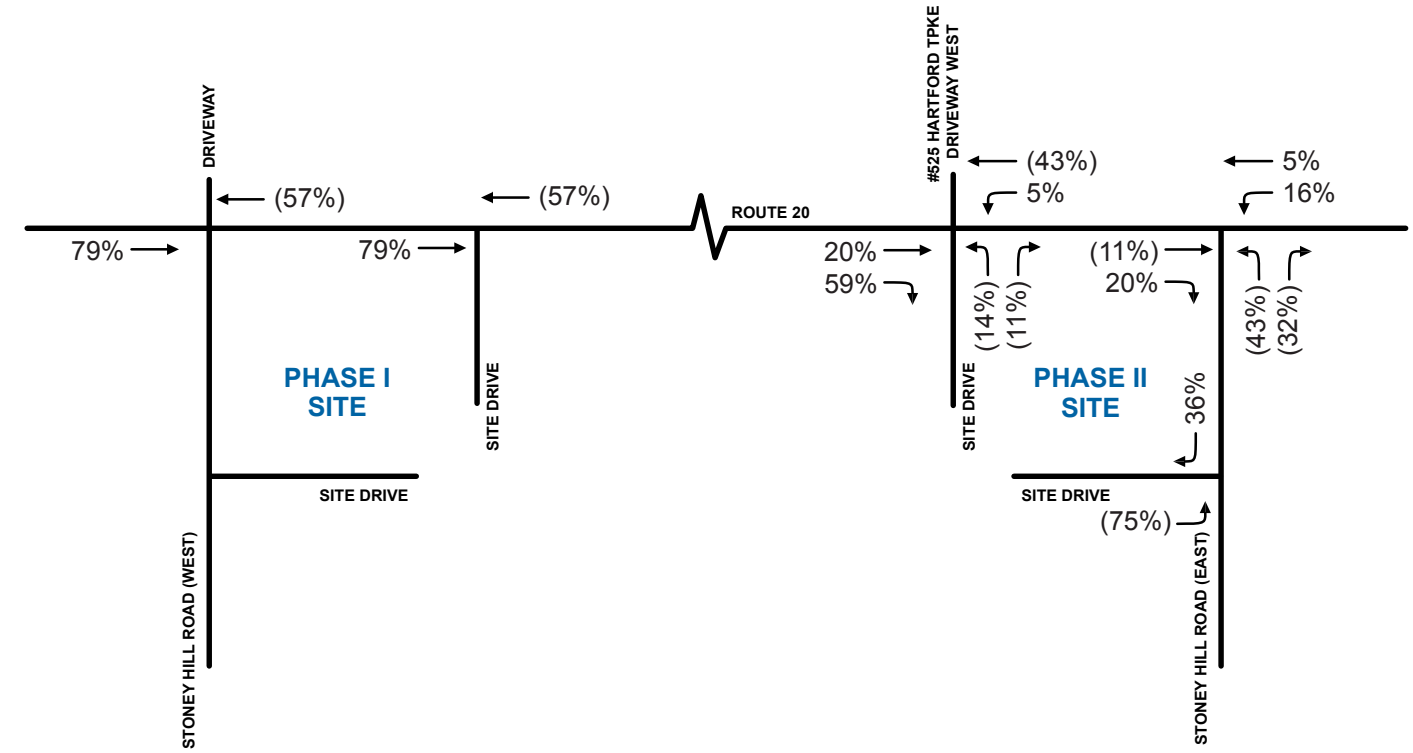
TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

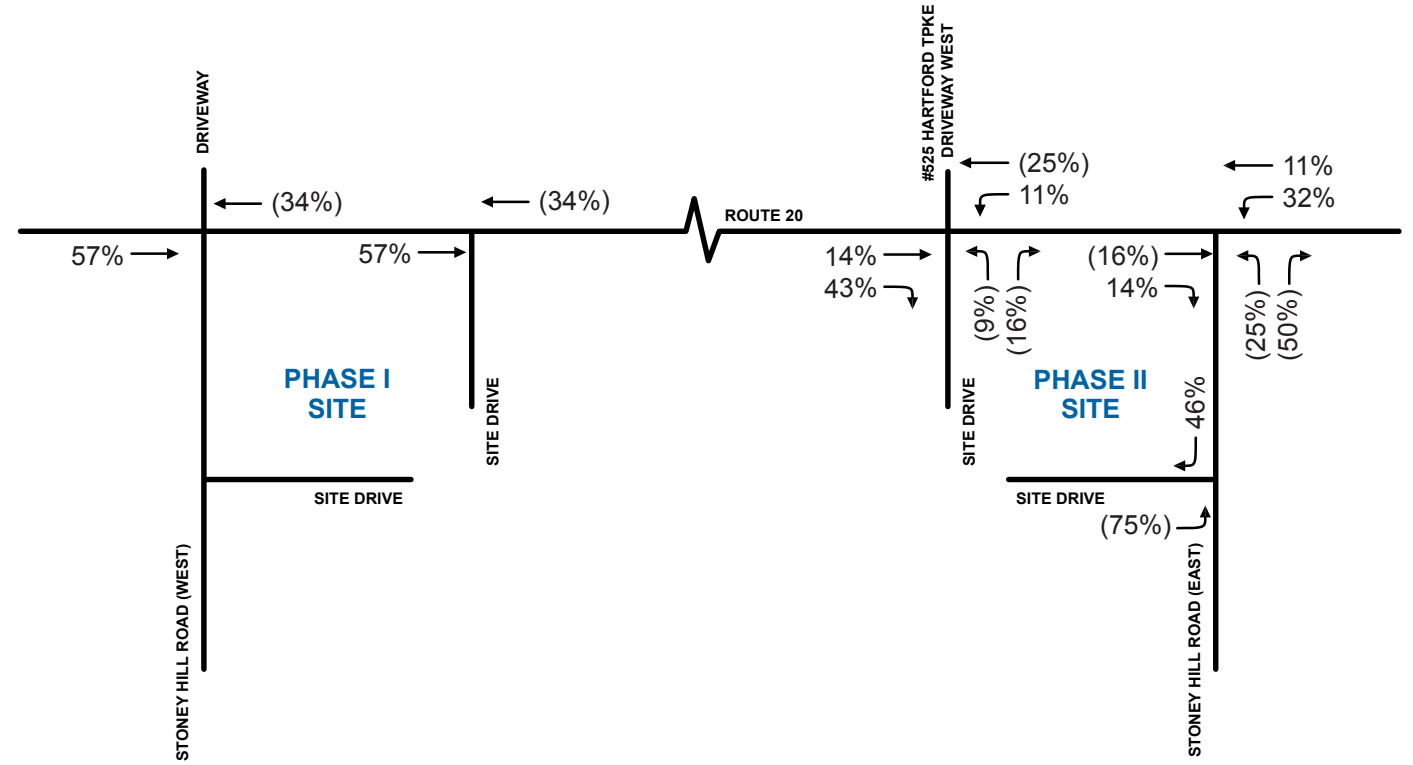
Shrewsbury, Massachusetts

Revised
Trip Distribution (Phase I)

Figure
8



AM Peak Hour



PM Peak Hour

TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

Shrewsbury, Massachusetts

Revised
Trip Distribution (Phase II)

Figure **9**

Warrant 1 – Eight-Hour Vehicular Volume

File Name: J:\PDI-Jobs\164876-Shrewsbury (TetraTech)\164876 B.ppd
Start Date: 1/7/2016
Start Time: 6:00:00 AM
Site Code: TBA
Comment 1: N/S: TriState Dr/Stoney Hill Road (West)
Comment 2: E/W: Hartford Turnpike (Route 20)
Comment 3: City, State: Shrewsbury, MA
Comment 4: Client: Tetra Tech/ N. Doherty

	TriState Truck Driveway From North				Hartford Turnpike (Route 20) From East				Stoney Hill Road (West) From South				Hartford Turnpike (Route 20) From West			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
06:00 AM	0	0	0	0	1	54	0	0	2	0	2	0	0	159	1	0
06:15 AM	0	0	0	0	3	63	0	0	0	0	1	0	2	175	8	0
06:30 AM	0	0	0	0	4	65	0	0	0	0	4	0	2	263	5	0
06:45 AM	0	0	0	0	3	75	0	0	1	0	4	0	1	315	8	0
07:00 AM	0	0	0	0	2	104	1	0	3	0	3	0	0	272	6	0
07:15 AM	0	0	0	0	2	115	0	0	4	0	4	0	1	297	7	0
07:30 AM	1	0	0	0	4	116	0	0	5	0	11	0	2	344	7	0
07:45 AM	0	0	0	0	2	128	0	0	5	0	5	0	1	351	11	0
08:00 AM	0	0	3	0	3	118	1	0	5	0	1	0	2	304	14	0
08:15 AM	0	0	0	0	2	112	1	0	8	0	11	0	3	302	3	0
08:30 AM	0	0	1	0	3	118	2	0	2	0	5	0	2	314	7	0
08:45 AM	0	0	0	0	3	136	1	0	1	0	3	0	2	256	3	0
09:00 AM	0	0	0	0	3	111	0	0	1	0	1	0	2	162	7	0
09:15 AM	1	0	0	0	3	107	0	0	4	0	2	0	1	212	7	0
09:30 AM	1	0	0	0	2	111	1	0	4	0	0	0	1	201	4	0
09:45 AM	0	0	0	0	5	106	3	0	1	0	2	0	2	175	2	0
10:00 AM	1	0	0	0	4	119	0	0	2	0	4	0	0	157	4	0
10:15 AM	0	0	0	0	1	138	1	0	5	0	3	0	0	162	11	0
10:30 AM	0	0	0	0	2	145	0	0	2	0	2	0	2	147	4	0
10:45 AM	4	0	0	0	3	131	1	0	0	0	2	0	1	146	6	0
11:00 AM	1	0	0	0	3	121	1	0	1	0	3	0	3	159	5	0
11:15 AM	1	0	1	0	4	135	1	0	0	0	1	0	1	162	9	0
11:30 AM	1	0	1	0	2	140	0	0	0	0	4	0	3	151	4	0
11:45 AM	0	0	0	0	3	163	0	0	1	0	1	0	2	150	7	0
12:00 PM	0	0	1	0	4	158	0	1	0	0	1	0	3	119	2	0
12:15 PM	0	0	0	0	3	170	4	0	1	0	3	0	0	160	9	0
12:30 PM	1	0	1	0	3	157	0	0	0	0	2	0	3	184	5	0
12:45 PM	0	0	0	0	1	170	0	0	0	0	3	0	2	159	3	0
01:00 PM	4	0	0	0	1	171	0	0	0	0	1	0	4	154	8	0
01:15 PM	0	0	0	0	2	170	1	0	2	0	1	0	1	149	5	0
01:30 PM	0	0	0	0	4	163	0	0	1	0	0	0	3	130	9	0
01:45 PM	1	0	0	0	3	139	0	0	0	0	2	0	2	148	2	0
02:00 PM	1	0	0	0	3	175	0	0	0	0	1	0	1	146	7	0
02:15 PM	0	0	0	0	3	188	0	0	1	0	2	0	4	152	6	0
02:30 PM	0	0	0	0	5	184	0	0	2	0	3	0	3	192	6	0
02:45 PM	1	0	0	0	4	218	1	0	0	0	2	0	5	202	7	0
03:00 PM	0	0	0	0	3	227	1	0	4	0	2	0	6	154	5	0
03:15 PM	0	0	1	0	4	207	4	0	1	0	6	0	3	148	5	0
03:30 PM	0	0	1	0	2	286	1	0	1	0	1	0	5	157	4	0
03:45 PM	1	0	0	0	0	239	1	0	2	0	3	0	4	180	3	0
04:00 PM	0	0	0	0	3	260	0	0	0	0	1	0	3	156	2	0
04:15 PM	1	0	0	0	3	258	3	0	2	0	3	0	9	141	5	0
04:30 PM	0	0	0	0	4	302	0	0	2	0	1	0	5	163	3	0
04:45 PM	0	0	0	0	1	277	6	0	3	0	3	0	9	159	2	0
05:00 PM	0	0	0	0	0	282	3	0	1	0	2	0	2	138	2	0
05:15 PM	1	0	0	0	1	323	1	0	3	0	4	0	7	158	1	0
05:30 PM	0	0	0	0	1	228	3	0	0	0	5	0	12	150	2	0
05:45 PM	0	0	0	0	0	244	4	0	1	1	6	0	8	179	3	0
06:00 PM	1	0	0	0	1	239	0	0	2	0	4	0	8	144	3	0
06:15 PM	1	0	0	0	0	236	3	0	2	0	4	0	5	119	1	0
06:30 PM	0	0	0	0	1	187	3	0	2	0	3	0	9	133	1	0
06:45 PM	0	0	1	0	1	181	3	0	1	0	8	0	7	104	2	0

	Stoney Hill WEST LEG NB			Rte. 20 EB	Rte. 20 WB		Stoney Hill Road WEST	
	LT	TH	RT	Rte. 20 EB	Rte 20 WB LT	Rte 20 WB TH/RT	INBOUND	OUTBOUND
06:00 AM	11	0	3	939	0	268	5	14
07:00 AM	23	0	17	1299	1	473	5	40
08:00 AM	20	0	16	1212	5	495	14	36
09:00 AM	5	0	10	776	4	448	10	15
10:00 AM	11	0	9	640	2	543	5	20
11:00 AM	9	0	2	656	2	571	11	11
12:00 PM	9	0	1	649	5	666	13	10
01:00 PM	4	0	3	615	1	653	11	7
02:00 PM	8	0	3	731	1	780	14	11
03:00 PM	12	0	8	674	7	968	25	20
04:00 PM	8	0	7	657	9	1108	35	15
05:00 PM	17	1	5	662	11	1079	40	23
06:00 PM	19	0	7	536	9	846	38	26
	156	1	91	10046	57	8898	226	248

File Name: J:\PDI-Jobs\164876-Shrewsbury (TetraTech)\164876 A.ppd
Start Date: 1/7/2016
Start Time: 6:00:00 AM
Site Code: TBA
Comment 1: S: Stoney Hill Road (East)
Comment 2: E/W: Hartford Turnpike (Route 20)
Comment 3: City, State: Shrewsbury, MA
Comment 4: Client: Tetra Tech/ N. Doherty

	Hartford Turnpike (Route 20) From East			Stoney Hill Road (East) From South			Hartford Turnpike (Route 20) From West		
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn
06:00 AM	55	1	0	5	0	0	0	155	0
06:15 AM	67	0	0	5	2	0	0	164	0
06:30 AM	67	1	0	1	2	0	1	246	0
06:45 AM	77	1	0	7	1	0	1	314	0
07:00 AM	100	1	0	15	4	0	0	262	0
07:15 AM	117	1	0	5	0	0	0	279	0
07:30 AM	114	3	0	10	2	0	2	329	0
07:45 AM	126	1	0	8	7	0	1	347	0
08:00 AM	114	1	0	10	3	0	1	302	0
08:15 AM	109	0	0	9	0	0	1	306	0
08:30 AM	114	2	0	9	2	0	1	314	0
08:45 AM	133	1	0	11	1	0	1	252	0
09:00 AM	109	3	0	6	1	0	1	172	0
09:15 AM	104	3	0	3	0	0	1	207	0
09:30 AM	108	1	0	6	0	0	0	201	0
09:45 AM	110	1	0	6	2	0	1	171	0
10:00 AM	110	3	0	5	1	0	0	150	0
10:15 AM	143	3	0	2	1	0	1	169	0
10:30 AM	145	2	0	4	0	0	0	142	0
10:45 AM	124	3	0	4	1	0	0	153	0
11:00 AM	128	0	0	2	1	0	0	156	0
11:15 AM	137	5	0	1	0	0	3	161	0
11:30 AM	135	1	0	1	2	0	1	145	0
11:45 AM	146	3	0	2	1	0	1	149	0
12:00 PM	174	5	0	3	1	0	1	120	0
12:15 PM	169	2	0	1	0	0	0	158	0
12:30 PM	156	6	0	1	0	0	0	175	0
12:45 PM	169	4	0	4	1	0	2	156	0
01:00 PM	165	2	0	3	1	0	1	157	0
01:15 PM	173	1	0	4	1	0	0	153	0
01:30 PM	159	1	0	3	2	0	0	137	0
01:45 PM	136	1	0	0	0	0	1	147	0
02:00 PM	182	4	0	1	0	0	0	141	0
02:15 PM	186	0	0	0	2	0	4	146	0
02:30 PM	189	6	0	6	1	0	3	191	0
02:45 PM	213	3	0	8	4	0	4	193	0
03:00 PM	237	7	0	4	4	0	4	156	0
03:15 PM	208	3	0	9	0	0	3	135	0
03:30 PM	287	8	0	5	1	0	2	161	0
03:45 PM	241	4	0	7	1	0	3	176	0
04:00 PM	264	2	0	1	0	0	3	148	0
04:15 PM	275	7	0	4	0	0	3	150	0
04:30 PM	312	4	0	1	0	0	3	162	0
04:45 PM	267	6	0	4	2	0	9	154	0
05:00 PM	284	5	0	6	0	0	1	139	0
05:15 PM	316	8	0	6	1	0	5	157	0
05:30 PM	231	14	0	7	3	0	1	152	0
05:45 PM	230	8	1	6	1	0	0	178	0
06:00 PM	241	19	0	3	1	0	2	138	0
06:15 PM	223	12	0	7	2	0	2	117	0
06:30 PM	189	10	0	7	0	0	2	132	0
06:45 PM	176	5	0	3	0	0	2	106	0

	Stoney Hill EAST LEG		Rte. 20 EB	Rte. 20 WB		Stoney Hill Road EAST	
	LT	RT	Rte. 20 EB	Rte 20 WB		INBOUND	OUTBOUND
06:00 AM	5	18	881	269		5	23
07:00 AM	13	38	1220	463		9	51
08:00 AM	6	39	1178	474		8	45
09:00 AM	3	21	754	439		11	24
10:00 AM	3	15	615	533		12	18
11:00 AM	4	6	616	555		14	10
12:00 PM	2	9	612	685		20	11
01:00 PM	4	10	596	638		7	14
02:00 PM	7	15	682	783		24	22
03:00 PM	6	25	640	995		34	31
04:00 PM	2	10	632	1137		37	12
05:00 PM	5	25	633	1097		43	30
06:00 PM	3	20	501	875		54	23
	63	251	9560	8943		278	314

Temp. Distribution from April 2014 ATRs

	Stoney Hill Road Both	
Hour	INBOUND	OUTBOUND
6:00	2%	7%
7:00	2%	16%
8:00	3%	13%
9:00	3%	6%
10:00	3%	5%
11:00	4%	3%
12:00	5%	5%
13:00	4%	5%
14:00	6%	4%
15:00	8%	4%
16:00	9%	7%
17:00	14%	7%
18:00	14%	6%
Total	77%	88%

Temp. Distribution from January 2015 Turning Movement Counts

Stoney Hill Road EAST		Stoney Hill Road WEST		Stoney Hill Road TOTAL	
INBOUND	OUTBOUND	INBOUND	OUTBOUND	INBOUND	OUTBOUND
5	23	5	14	10	37
9	51	5	40	14	91
8	45	14	36	22	81
11	24	10	15	21	39
12	18	5	20	17	38
14	10	11	11	25	21
20	11	13	10	33	21
7	14	11	7	18	21
24	22	14	11	38	33
34	31	25	20	59	51
37	12	35	15	72	27
43	30	40	23	83	53
54	23	38	26	92	49
278	314	226	248	504	562

Temporal Distribution	
INBOUND	OUTBOUND
2%	**6%**
2%	**14%**
3%	**13%**
3%	**6%**
3%	**6%**
4%	**3%**
5%	**3%**
3%	**3%**
6%	**5%**
9%	**8%**
11%	**4%**
13%	**8%**
14%	**8%**
77%	**88%**

Traffic Signal Warrant Volumes at Route 20/Stoney Hill Road (EAST)

	Raw Data							Adjusted to Average Annual (1.057)							Redistribution from West Leg to East Leg			Average East and West Legs Stoney Hill Road Temporal Distribution (from 2015 TMCs and 2014 ATRs)		Project Trips (Daily Trips * Temporal Dist. * Directional Dist.)									2015 Existing + Project				Does hour meet Warrant 1 Criteria: Route 20: 525 vph Stoney Hill Road: 53 vhp
	2015 East Leg				2015 West Leg			2015 East Leg				2015 West Leg								Phase I Trips			Phase II Trips			Total Project Trips							
	Rte. 20	Rte. 20	Stoney Hill Rd. EAST		Rte 20 WB	Stoney Hill Rd. WEST		Rte. 20	Rte. 20	Stoney Hill Rd. EAST		Rte 20 WB	Stoney Hill Rd. WEST		Rte. 20 WB Left at West shifted to East	Stoney Hill West Left shifted to East	25% Rt turn from West to East*																
Hour	EB	WB	LT	RT	LT	LT	RT	EB	WB	LT	RT	LT	LT	RT			0.25	In (SB)	Out (NB)	EB	WB	NB	EB	WB	NB	EB	WB	NB	EB	WB	Total	NB	
6:00	881	269	5	18	0	11	3	931	284	5	19	0	12	3	0	12	1	1.5%	5.8%	15	2	20	3	1	16	19	3	36	949	287	**1237**	**73**	**YES**
7:00	1220	463	13	38	1	23	17	1290	489	14	40	1	24	18	1	24	4	2.2%	14.3%	37	3	50	7	2	39	45	4	89	1332	494	**1826**	**171**	**YES**
8:00	1178	474	6	39	5	20	16	1245	501	6	41	5	21	17	5	21	4	3.4%	12.7%	33	4	44	8	3	35	41	7	79	1284	508	**1792**	**152**	**YES**
9:00	754	439	3	21	4	5	10	797	464	3	22	4	5	11	4	5	3	3.2%	6.1%	16	4	21	5	2	17	21	7	38	816	471	**1287**	**71**	**YES**
10:00	615	533	3	15	2	11	9	650	563	3	16	2	12	10	2	12	2	2.6%	6.0%	16	3	21	4	2	16	20	5	37	669	569	**1237**	**70**	**YES**
11:00	616	555	4	6	2	9	2	651	587	4	6	2	10	2	2	10	1	3.8%	3.3%	9	5	11	4	3	9	13	8	20	664	594	**1258**	**41**	
12:00	612	685	2	9	5	9	1	647	724	2	10	5	10	1	5	10		5.1%	3.3%	13	13	7	5	8	9	18	21	16	665	745	**1410**	**37**	
13:00	596	638	4	10	1	4	3	630	674	4	11	1	4	3	1	4		2.8%	3.3%	13	7	7	3	4	9	17	12	16	647	686	**1332**	**35**	
14:00	682	783	7	15	1	8	3	721	828	7	16	1	8	3	1	8		5.8%	5.2%	21	15	11	6	9	14	27	24	25	748	852	**1600**	**57**	**YES**
15:00	640	995	6	25	7	12	8	676	1052	6	26	7	13	8	7	13		9.1%	8.0%	32	24	17	9	14	22	41	38	39	718	1090	**1808**	**84**	**YES**
16:00	632	1137	2	10	9	8	7	668	1202	2	11	10	8	7	10	8		11.1%	4.2%	17	29	9	8	17	12	25	46	20	693	1248	**1941**	**42**	
17:00	633	1097	5	25	11	17	5	669	1160	5	26	12	18	5	12	18		12.8%	8.3%	33	33	17	11	20	23	45	53	40	714	1213	**1927**	**90**	**YES**
18:00	501	875	3	20	9	19	7	530	925	3	21	10	20	7	10	20		14.1%	7.7%	31	37	16	12	22	21	43	59	37	572	984	**1556**	**81**	**YES**

* Residents indicate drivers turn right and make either a u-turn to proceed west or proceed to Cherry Street to access Route 140. This is confirmed by measured outbound distributution during morning peak hour as compared to inbound distrubution during afternoon peak hour.

Daily Trips (one dir.)	607

Directional Distributions	Out to the East (EB)	WB IN
AM Dist	43%	21%
PM Dist	66%	43%

	NB OUT
AM Dist.	57%
PM Dist	34%

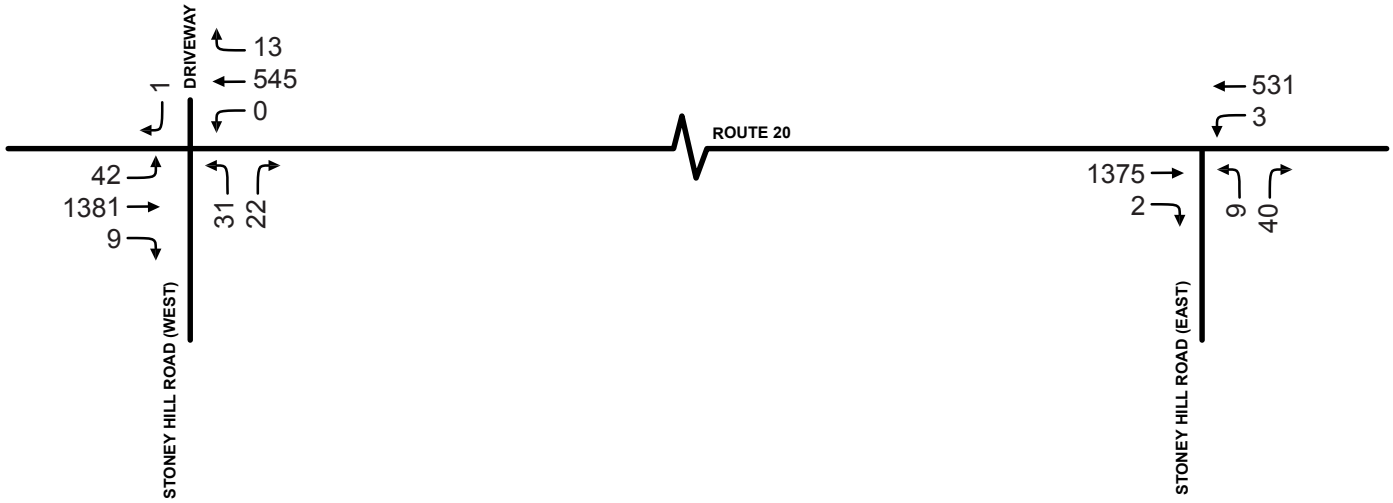
Daily Trips (one dir.)	365

Directional Distributions	EB IN	WB IN
AM Dist	20%	21%
PM Dist	14%	43%

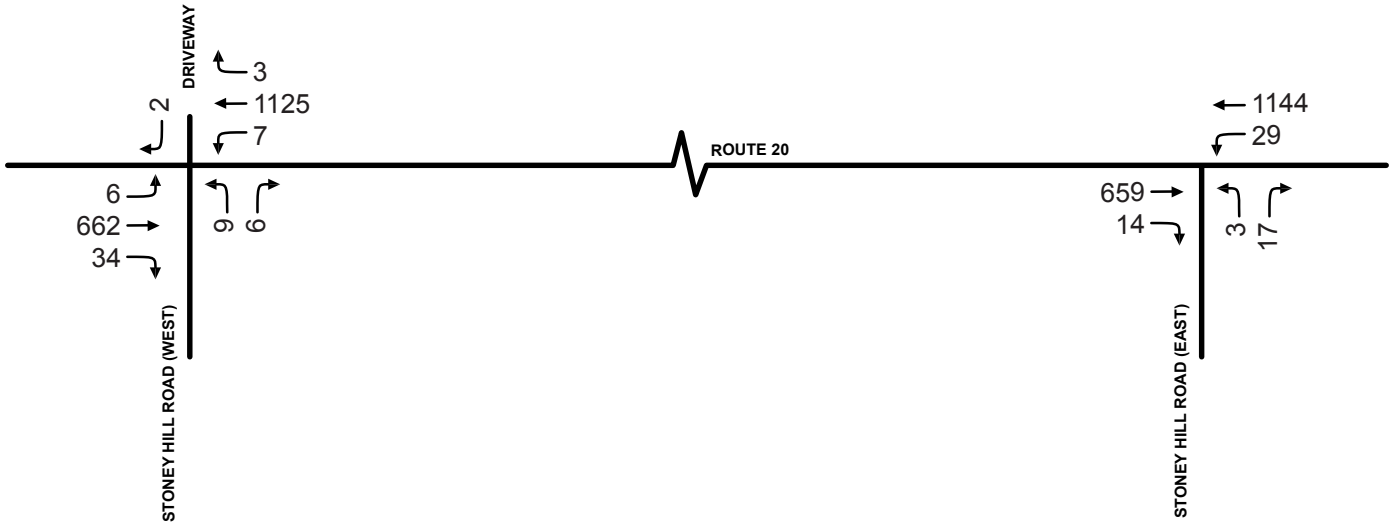
	NB OUT	EB OUT
AM Dist.	75%	11%
PM Dist	75%	16%

ATTACHMENT B – UPDATED 2022 BUILD CONDITION PEAK HOUR VOLUMES

Note: The figures in this attachment are numbered to be consistent with the figures presented in the *Traffic Impact and Access Study* (Tetra Tech, November 2015).



AM Peak Hour



PM Peak Hour

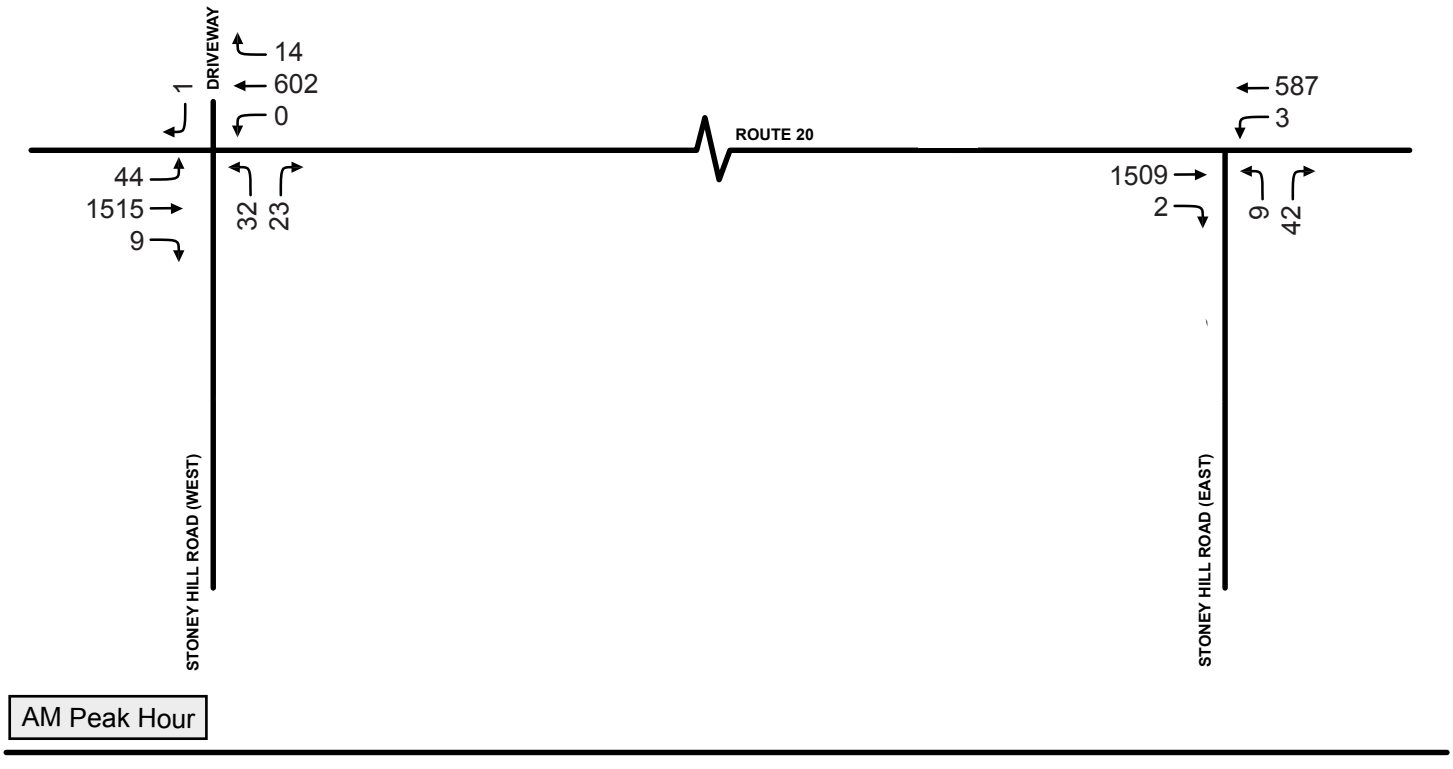
TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

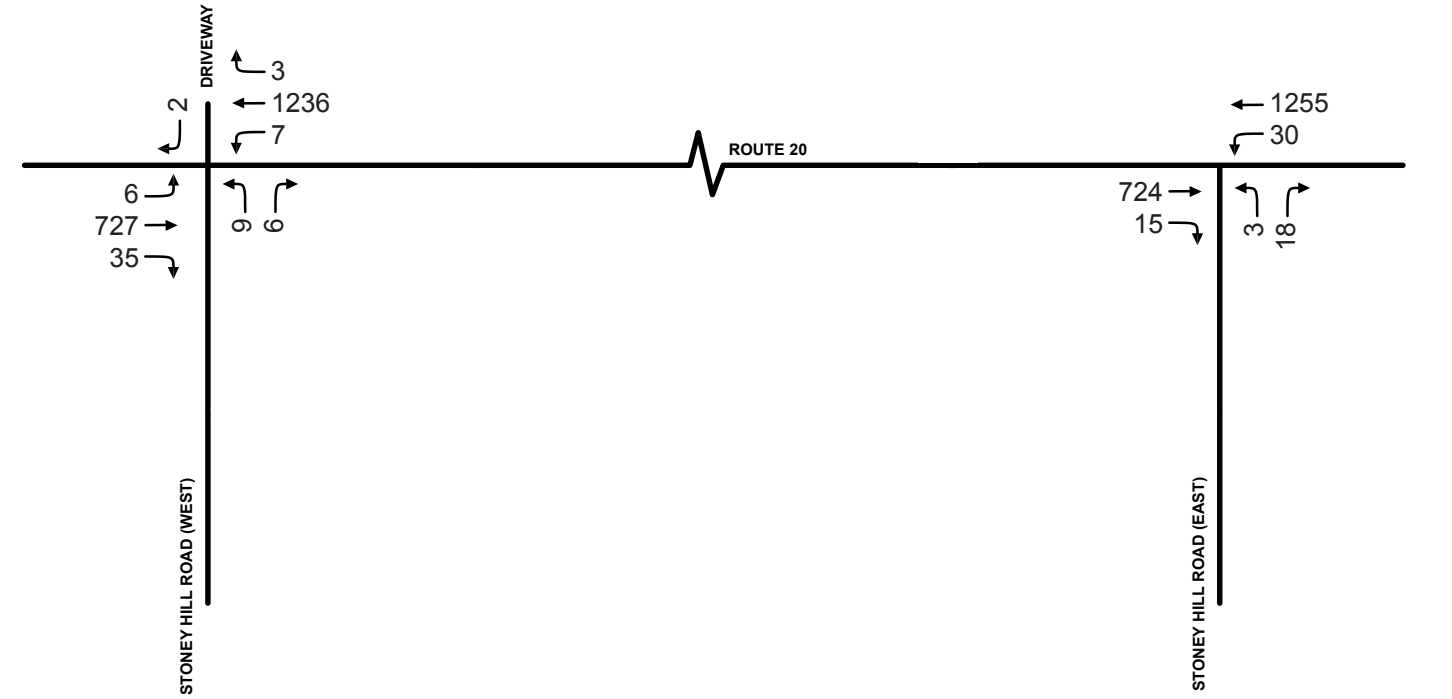
Shrewsbury, Massachusetts

2015 Existing AM & PM Peak Hour Traffic Volumes

Figure 6



AM Peak Hour



PM Peak Hour

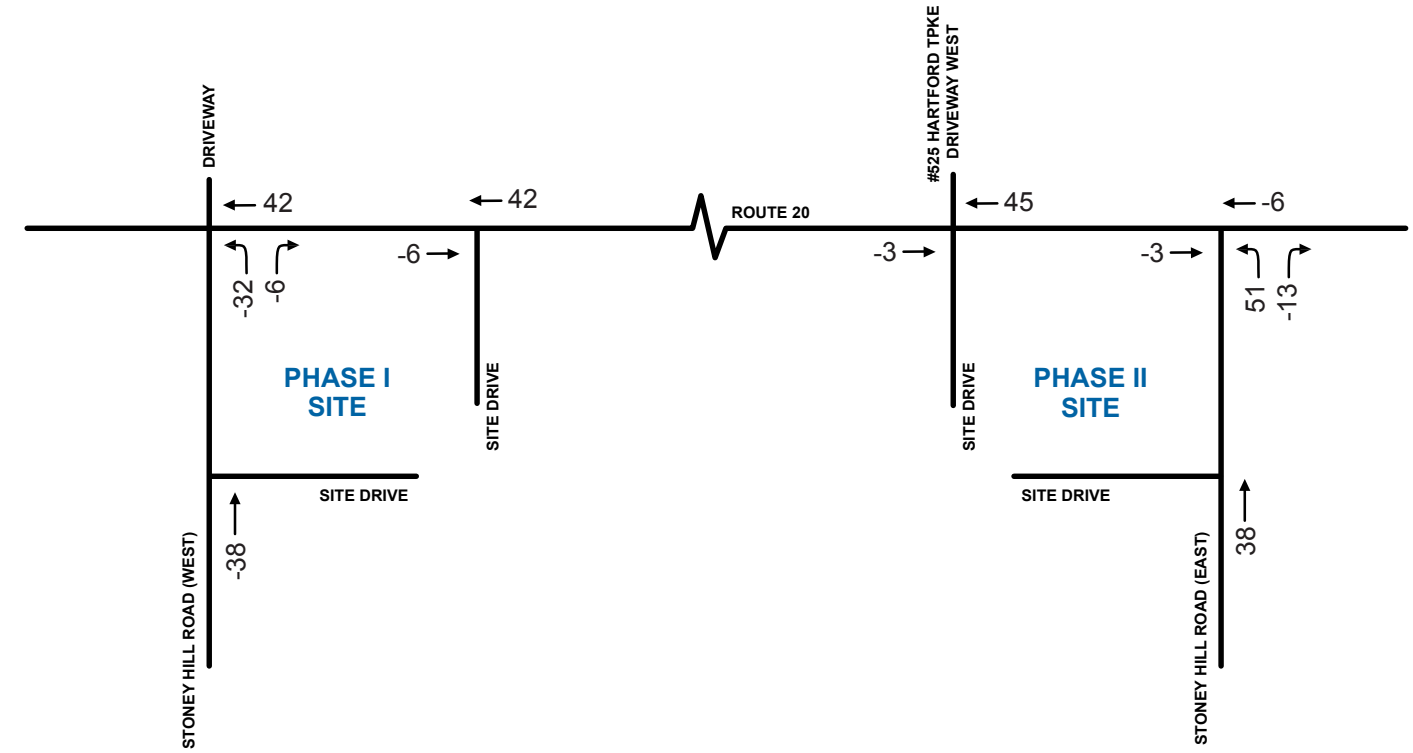
TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

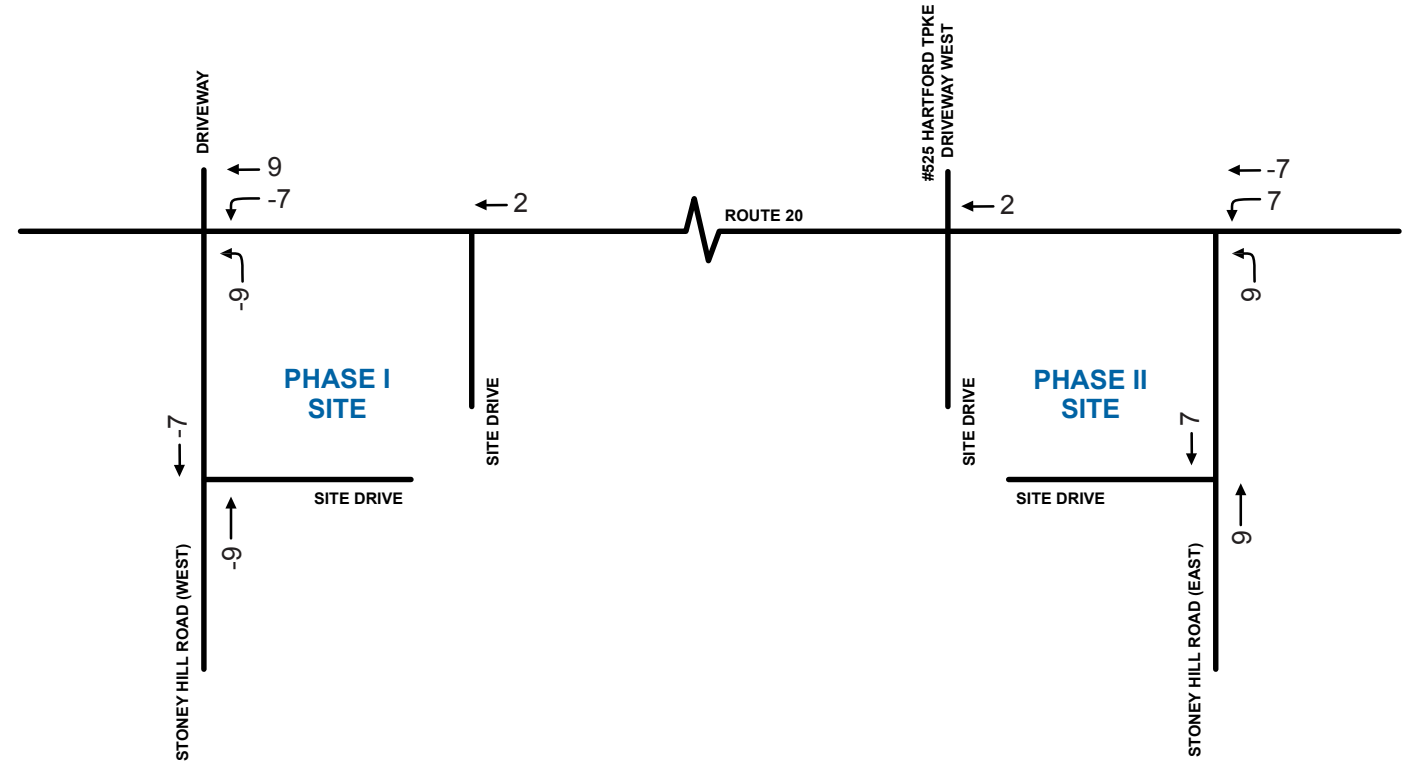
Shrewsbury, Massachusetts

2022 No-Build AM & PM Peak Hour Traffic Volumes

Figure 7



AM Peak Hour



PM Peak Hour

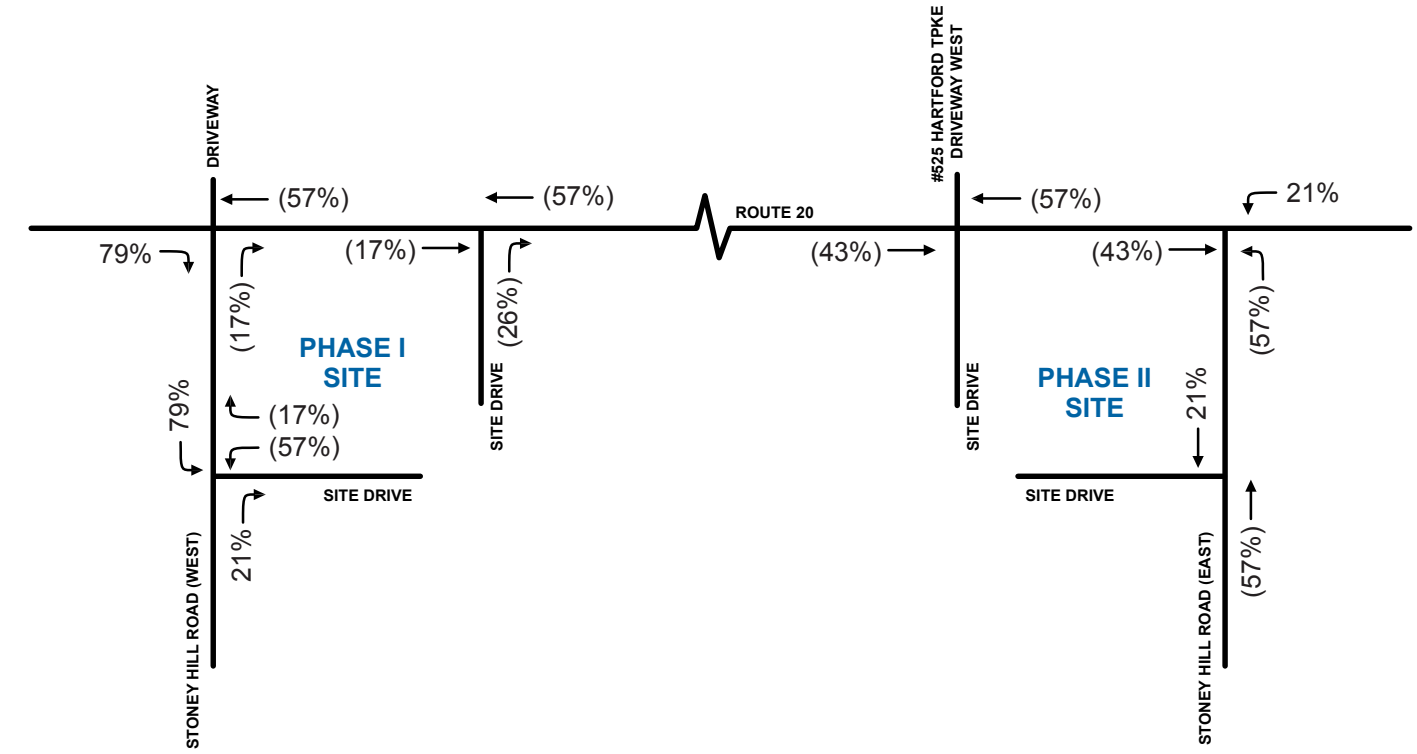
TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

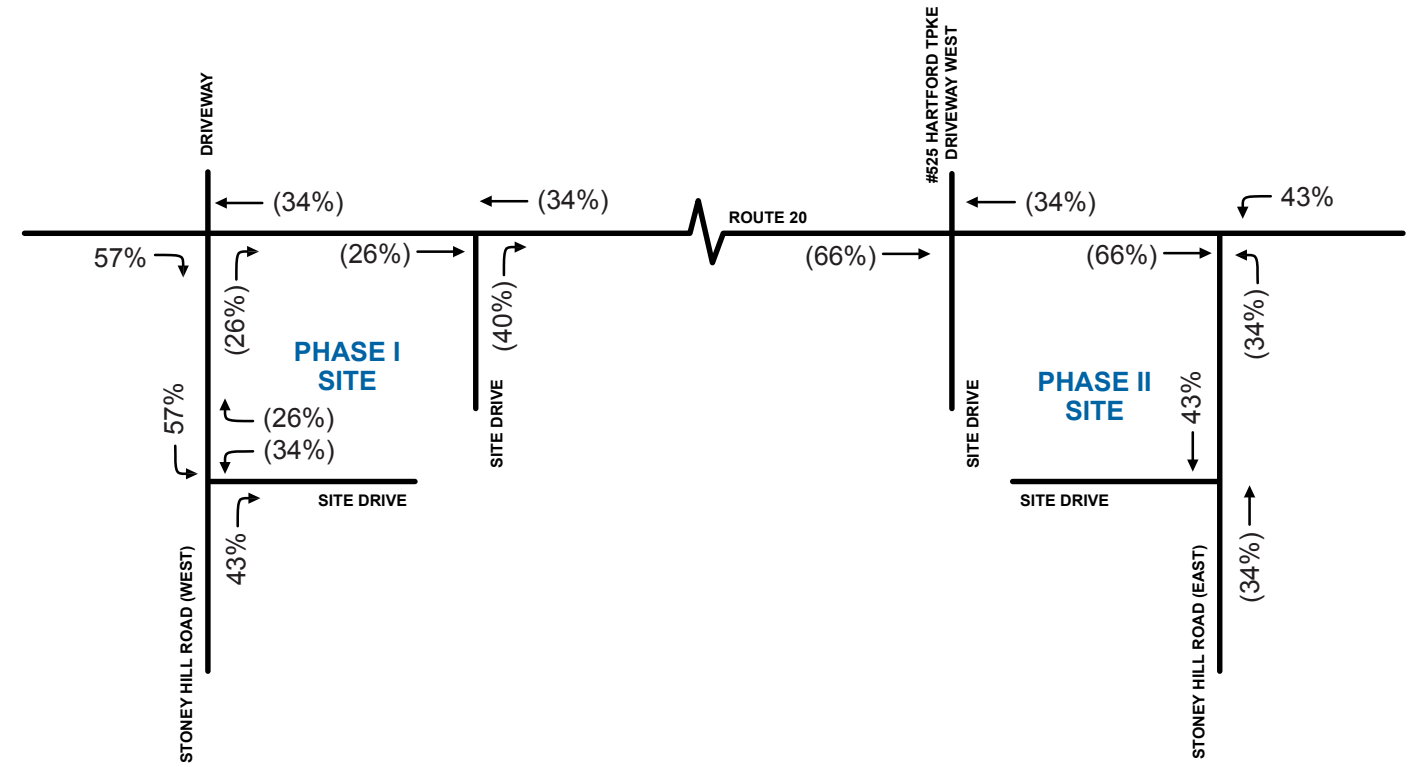
Shrewsbury, Massachusetts

2022 No-Build Redistribution of Traffic Volumes

Figure **7A**



AM Peak Hour



PM Peak Hour

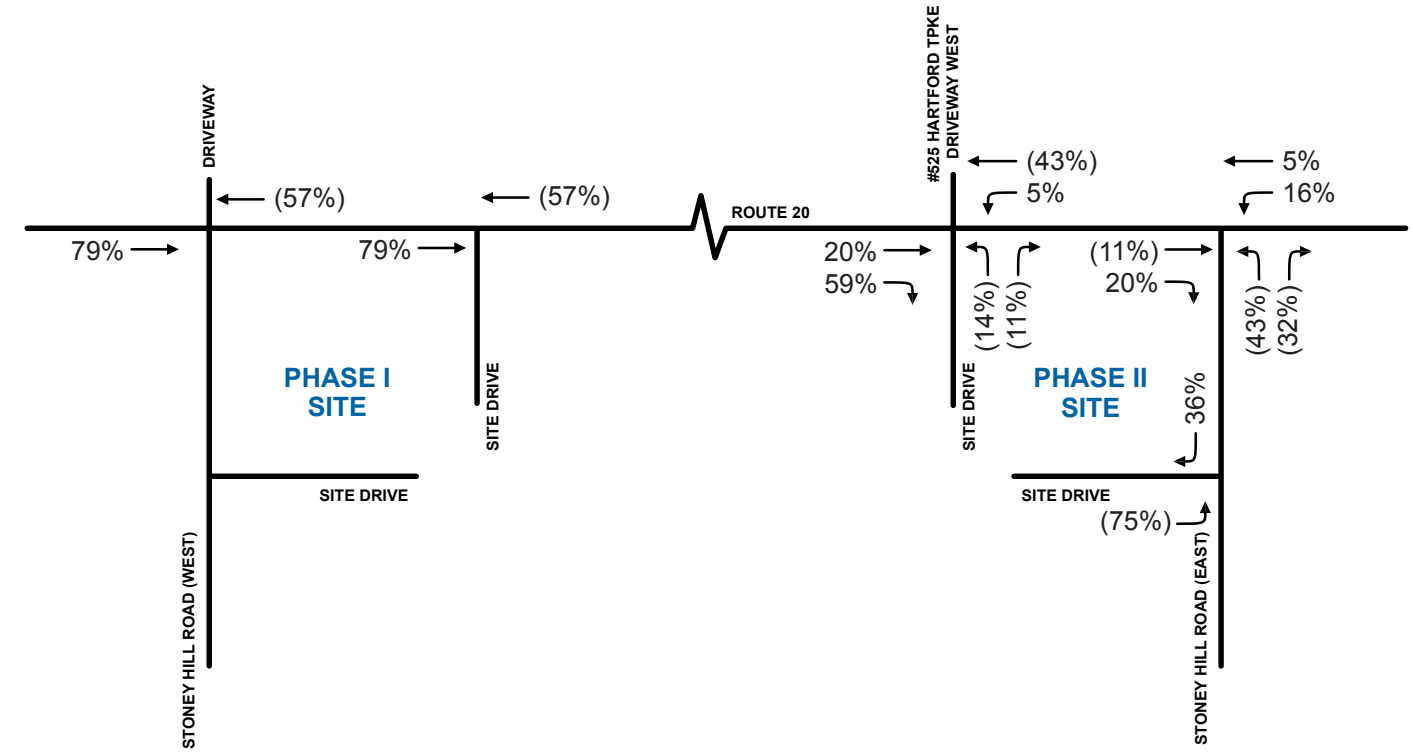
TETRATECH
100 Nickerson Road
Marlborough, MA 01752
508.786.2200
www.tetratech.com

Not To Scale

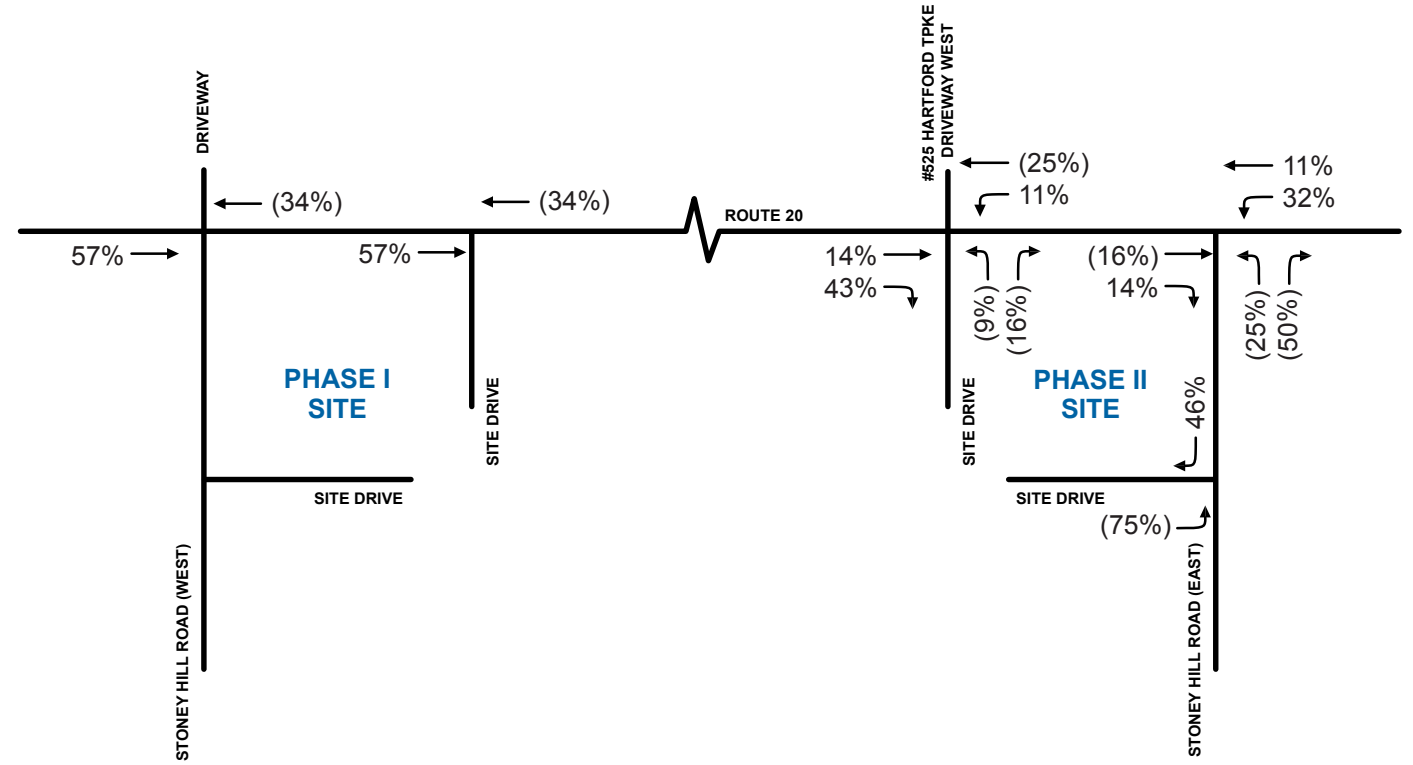
Shrewsbury, Massachusetts

Revised
Trip Distribution (Phase I)

Figure
8



AM Peak Hour



PM Peak Hour

TETRATECH
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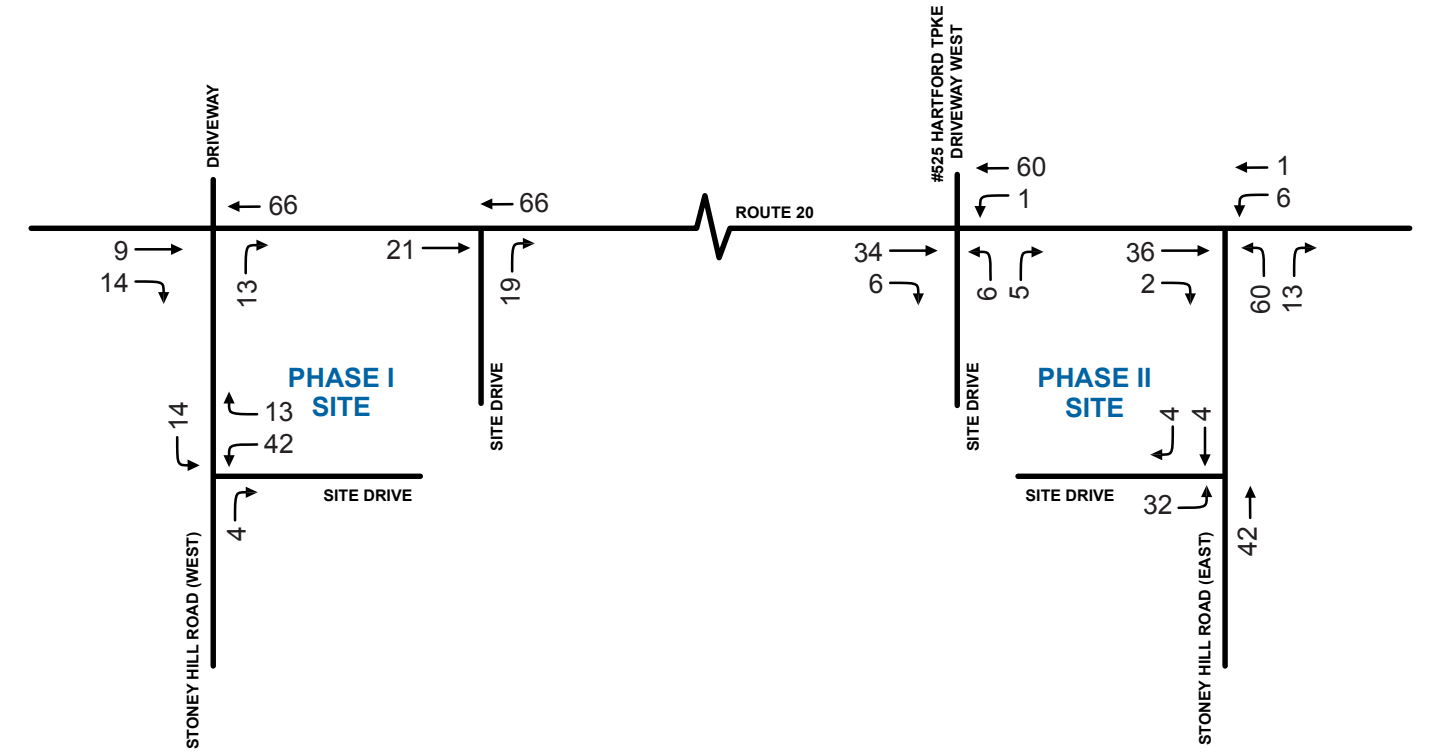
508.786.2200
www.tetratech.com

Not To Scale

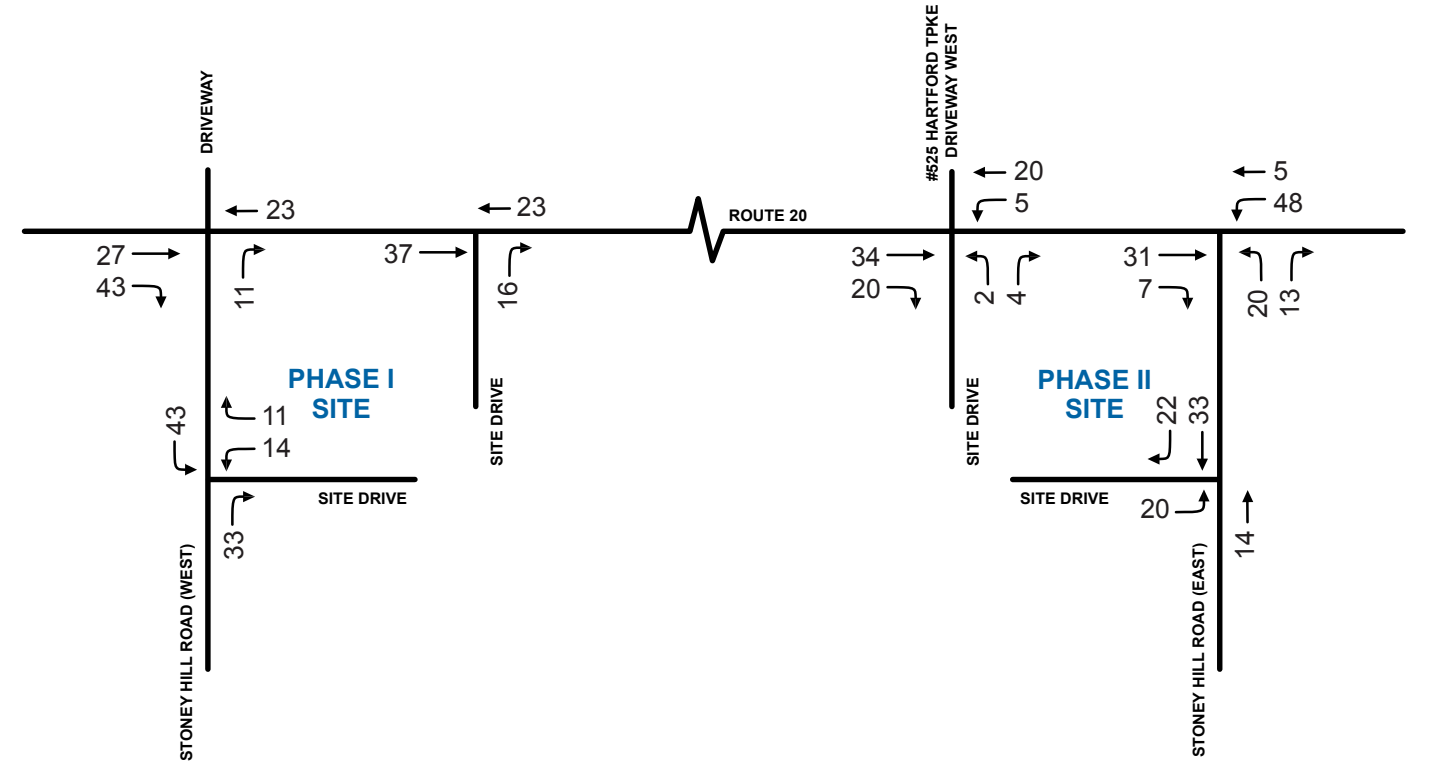
Shrewsbury, Massachusetts

Revised
Trip Distribution (Phase II)

Figure **9**



AM Peak Hour



PM Peak Hour

TETRATECH

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Marlborough, MA 01752
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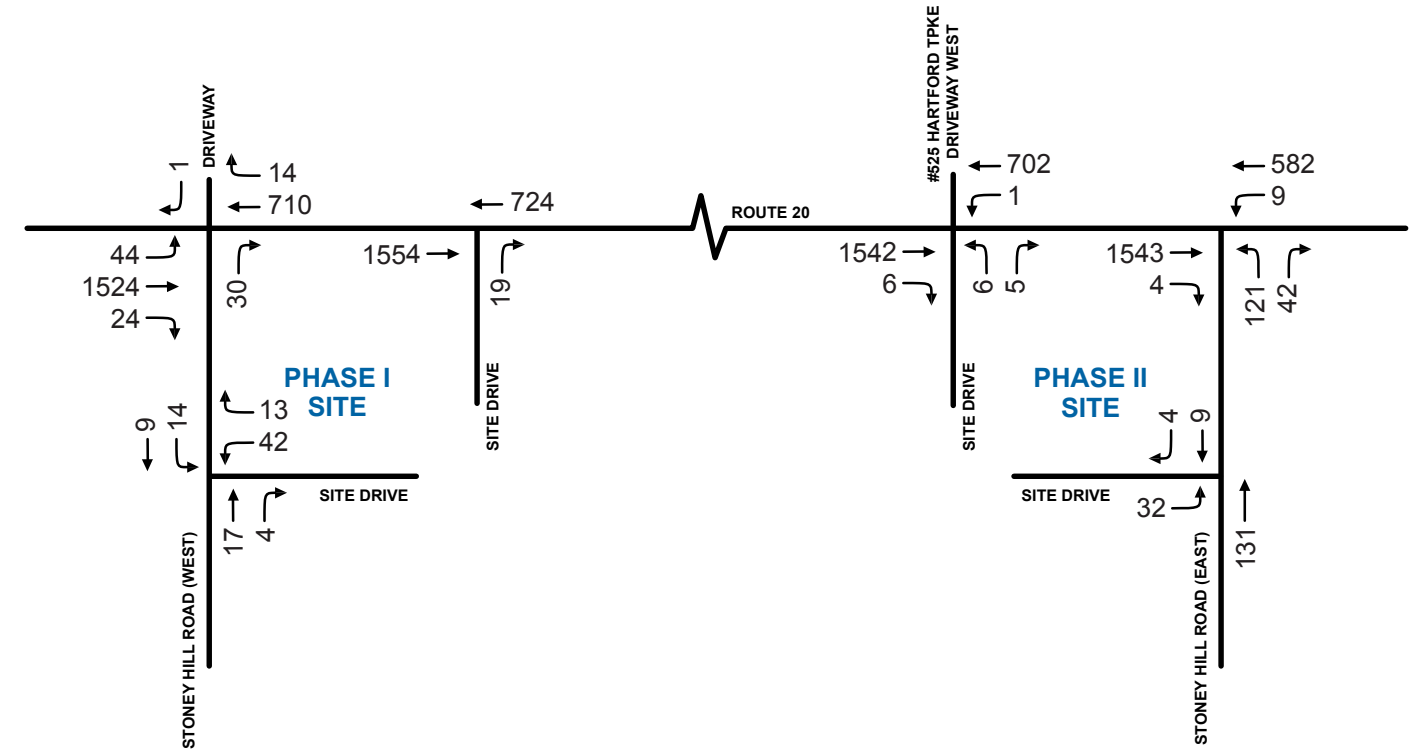
Not To Scale

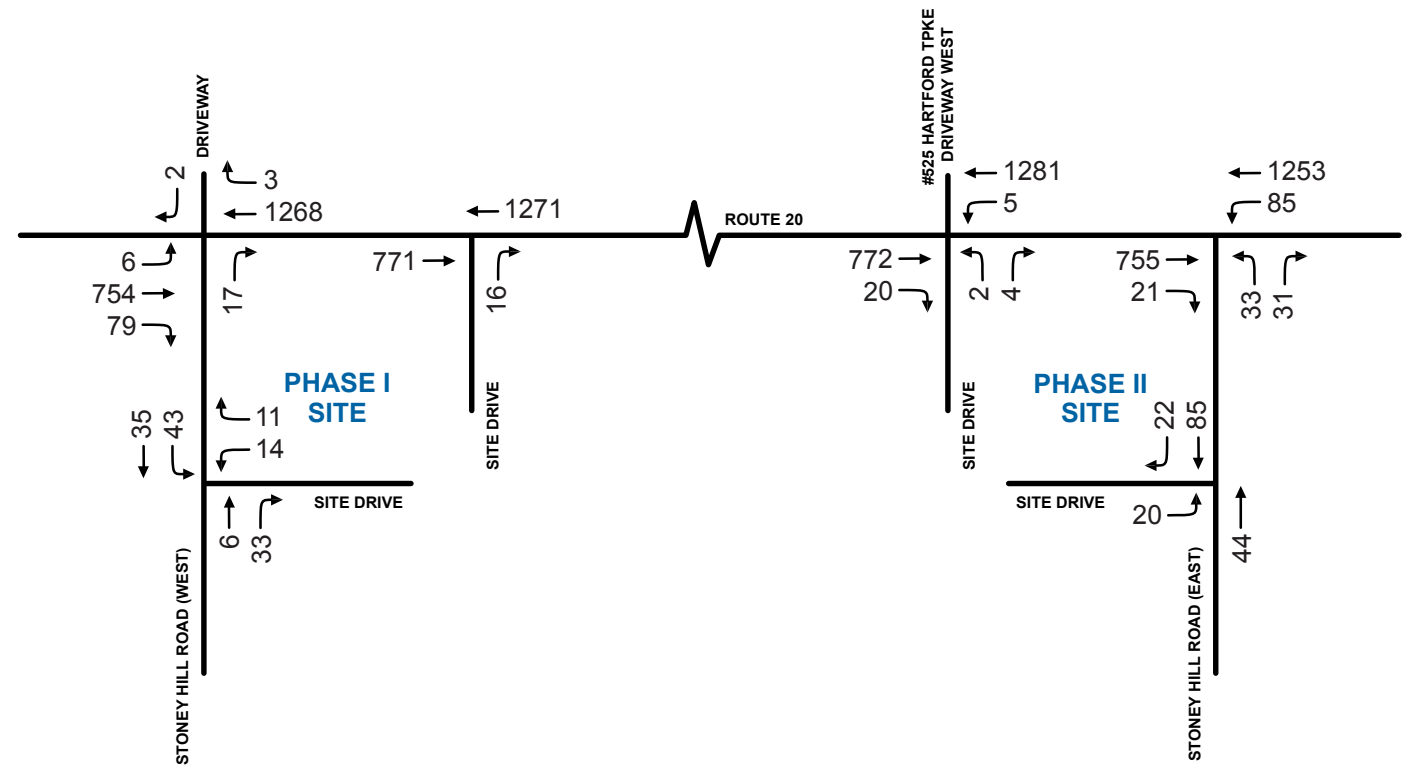
Shrewsbury, Massachusetts

Project Trips

Figure **10**



AM Peak Hour



PM Peak Hour

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508.786.2200
www.tetratech.com

Not To Scale

Shrewsbury, Massachusetts

2022 Build
Peak Hour Traffic Volumes

Figure **11**

ATTACHMENT C – CAPACITY ANALYSES

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Volume (vph)	1543	9	582	121
Lane Group Flow (vph)	1681	0	643	178
Turn Type	NA	pm+pt	NA	Prot
Protected Phases	2	1	6	8
Permitted Phases		6		
Detector Phase	2	1	6	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	11.0	8.0	11.0	11.0
Total Split (s)	96.0	11.0	107.0	13.0
Total Split (%)	80.0%	9.2%	89.2%	10.8%
Yellow Time (s)	4.0	3.5	4.0	4.0
All-Red Time (s)	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0
Lead/Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		
Recall Mode	C-Max	None	C-Max	None
v/c Ratio	1.11		0.75	1.42
Control Delay	74.1		10.6	268.5
Queue Delay	0.0		0.0	0.0
Total Delay	74.1		10.6	268.5
Queue Length 50th (ft)	~1493		149	~178
Queue Length 95th (ft)	#1757		296	#326
Internal Link Dist (ft)	299		682	238
Turn Bay Length (ft)				
Base Capacity (vph)	1509		856	125
Starvation Cap Reductn	0		0	0
Spillback Cap Reductn	0		0	0
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	1.11		0.75	1.42

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Stoney Hill Dr (East) & Rte. 20

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1543	4	9	582	121	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	1.00			1.00	0.97	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1775			1675	1732	
Flt Permitted	1.00			0.60	0.96	
Satd. Flow (perm)	1775			1008	1732	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1677	4	10	633	132	46
RTOR Reduction (vph)	0	0	0	0	10	0
Lane Group Flow (vph)	1681	0	0	643	168	0
Heavy Vehicles (%)	7%	0%	33%	13%	0%	8%
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases			6			
Actuated Green, G (s)	102.0			102.0	8.0	
Effective Green, g (s)	102.0			102.0	8.0	
Actuated g/C Ratio	0.85			0.85	0.07	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1508			856	115	
v/s Ratio Prot	c0.95				c0.10	
v/s Ratio Perm				0.64		
v/c Ratio	1.11			0.75	1.46	
Uniform Delay, d1	9.0			3.7	56.0	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	61.4			3.7	247.8	
Delay (s)	70.4			7.5	303.8	
Level of Service	E			A	F	
Approach Delay (s)	70.4			7.5	303.8	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	70.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Volume (vph)	755	85	1253	33
Lane Group Flow (vph)	844	0	1454	70
Turn Type	NA	pm+pt	NA	Prot
Protected Phases	2	1	6	8
Permitted Phases		6		
Detector Phase	2	1	6	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	11.0	8.0	11.0	11.0
Total Split (s)	98.0	11.0	109.0	11.0
Total Split (%)	81.7%	9.2%	90.8%	9.2%
Yellow Time (s)	4.0	3.5	4.0	4.0
All-Red Time (s)	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0
Lead/Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		
Recall Mode	C-Max	None	C-Max	None
v/c Ratio	0.53		0.98	0.61
Control Delay	3.1		27.7	57.6
Queue Delay	0.0		0.0	0.0
Total Delay	3.1		27.7	57.6
Queue Length 50th (ft)	111		~853	31
Queue Length 95th (ft)	155		#1445	#95
Internal Link Dist (ft)	299		682	238
Turn Bay Length (ft)				
Base Capacity (vph)	1598		1487	115
Starvation Cap Reductn	0		0	0
Spillback Cap Reductn	0		0	0
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	0.53		0.98	0.61

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Stoney Hill Dr (East) & Rte. 20

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	755	21	85	1253	33	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	1.00			1.00	0.93	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1789			1859	1731	
Flt Permitted	1.00			0.89	0.97	
Satd. Flow (perm)	1789			1665	1731	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	821	23	92	1362	36	34
RTOR Reduction (vph)	0	0	0	0	29	0
Lane Group Flow (vph)	844	0	0	1454	41	0
Heavy Vehicles (%)	6%	0%	0%	2%	0%	0%
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases			6			
Actuated Green, G (s)	105.2			105.2	4.8	
Effective Green, g (s)	105.2			105.2	4.8	
Actuated g/C Ratio	0.88			0.88	0.04	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1568			1459	69	
v/s Ratio Prot	0.47				c0.02	
v/s Ratio Perm				c0.87		
v/c Ratio	0.54			1.00	0.60	
Uniform Delay, d1	1.7			7.2	56.6	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.3			22.6	13.1	
Delay (s)	3.1			29.8	69.8	
Level of Service	A			C	E	
Approach Delay (s)	3.1			29.8	69.8	
Approach LOS	A			C	E	

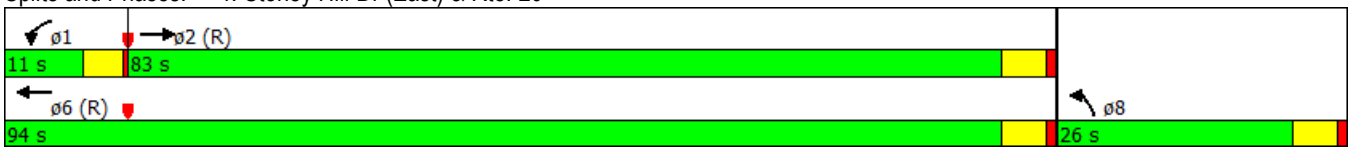
Intersection Summary			
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	127.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Volume (vph)	1543	9	582	121
Lane Group Flow (vph)	1681	10	633	178
Turn Type	NA	Prot	NA	Prot
Protected Phases	2	1	6	8
Permitted Phases				
Detector Phase	2	1	6	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	11.0	8.0	11.0	11.0
Total Split (s)	83.0	11.0	94.0	26.0
Total Split (%)	69.2%	9.2%	78.3%	21.7%
Yellow Time (s)	4.0	3.5	4.0	4.0
All-Red Time (s)	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0
Lead/Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		
Recall Mode	C-Max	None	C-Max	None
v/c Ratio	0.65	0.14	0.48	0.72
Control Delay	9.6	58.3	6.6	62.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.6	58.3	6.6	62.4
Queue Length 50th (ft)	254	8	146	124
Queue Length 95th (ft)	535	26	249	194
Internal Link Dist (ft)	299		682	238
Turn Bay Length (ft)		350		
Base Capacity (vph)	2573	79	1312	313
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.13	0.48	0.57

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 4: Stoney Hill Dr (East) & Rte. 20



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1543	4	9	582	121	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0	5.0	5.0	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	0.96	
Satd. Flow (prot)	3373		1357	1681	1732	
Flt Permitted	1.00		0.95	1.00	0.96	
Satd. Flow (perm)	3373		1357	1681	1732	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1677	4	10	633	132	46
RTOR Reduction (vph)	0	0	0	0	11	0
Lane Group Flow (vph)	1681	0	10	633	167	0
Heavy Vehicles (%)	7%	0%	33%	13%	0%	8%
Turn Type	NA		Prot	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases						
Actuated Green, G (s)	88.3		1.4	93.7	16.3	
Effective Green, g (s)	88.3		1.4	93.7	16.3	
Actuated g/C Ratio	0.74		0.01	0.78	0.14	
Clearance Time (s)	5.0		4.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2481		15	1312	235	
v/s Ratio Prot	c0.50		0.01	c0.38	c0.10	
v/s Ratio Perm						
v/c Ratio	0.68		0.67	0.48	0.71	
Uniform Delay, d1	8.4		59.1	4.6	49.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.5		75.9	1.3	9.4	
Delay (s)	9.9		134.9	5.9	59.0	
Level of Service	A		F	A	E	
Approach Delay (s)	9.9			7.9	59.0	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Volume (vph)	755	85	1253	33
Lane Group Flow (vph)	844	92	1362	70
Turn Type	NA	Prot	NA	Prot
Protected Phases	2	1	6	8
Permitted Phases				
Detector Phase	2	1	6	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	11.0	8.0	11.0	11.0
Total Split (s)	89.0	20.0	109.0	11.0
Total Split (%)	74.2%	16.7%	90.8%	9.2%
Yellow Time (s)	4.0	3.5	4.0	4.0
All-Red Time (s)	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	4.0	5.0	5.0
Lead/Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		
Recall Mode	C-Max	None	C-Max	None
v/c Ratio	0.33	0.54	0.82	0.61
Control Delay	5.7	62.6	9.1	57.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.7	62.6	9.1	57.6
Queue Length 50th (ft)	103	69	353	31
Queue Length 95th (ft)	152	120	590	#95
Internal Link Dist (ft)	299		682	238
Turn Bay Length (ft)		350		
Base Capacity (vph)	2571	240	1664	115
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.38	0.82	0.61

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Stoney Hill Dr (East) & Rte. 20

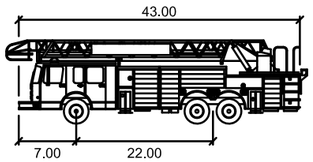
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	755	21	85	1253	33	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		4.0	5.0	5.0	
Lane Util. Factor	0.95		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	0.93	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	3397		1805	1863	1731	
Flt Permitted	1.00		0.95	1.00	0.97	
Satd. Flow (perm)	3397		1805	1863	1731	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	821	23	92	1362	36	34
RTOR Reduction (vph)	1	0	0	0	29	0
Lane Group Flow (vph)	843	0	92	1362	41	0
Heavy Vehicles (%)	6%	0%	0%	2%	0%	0%
Turn Type	NA		Prot	NA	Prot	
Protected Phases	2		1	6	8	
Permitted Phases						
Actuated Green, G (s)	89.8		11.4	105.2	4.8	
Effective Green, g (s)	89.8		11.4	105.2	4.8	
Actuated g/C Ratio	0.75		0.10	0.88	0.04	
Clearance Time (s)	5.0		4.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	2542		171	1633	69	
v/s Ratio Prot	0.25		0.05	c0.73	c0.02	
v/s Ratio Perm						
v/c Ratio	0.33		0.54	0.83	0.60	
Uniform Delay, d1	5.1		51.8	3.4	56.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.4		3.2	5.2	13.1	
Delay (s)	5.4		55.0	8.6	69.8	
Level of Service	A		E	A	E	
Approach Delay (s)	5.4			11.5	69.8	
Approach LOS	A			B	E	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

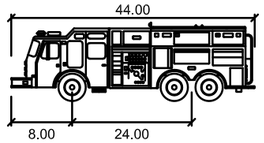
Appendix C

Truck Turn Analysis



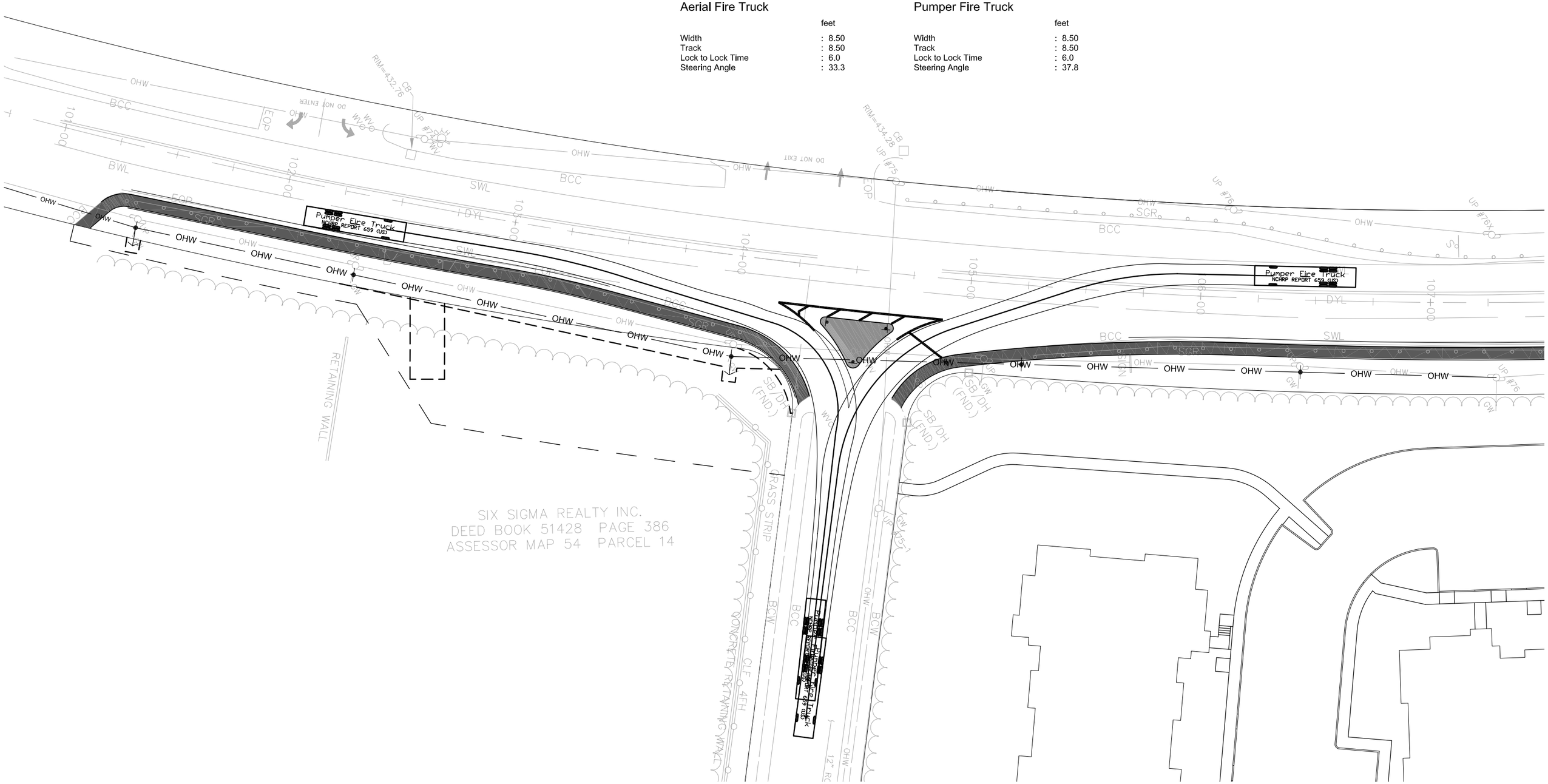
Aerial Fire Truck

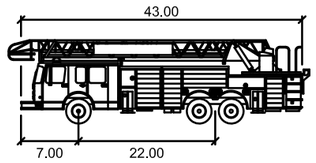
		feet
Width	:	8.50
Track	:	8.50
Lock to Lock Time	:	6.0
Steering Angle	:	33.3



Pumper Fire Truck

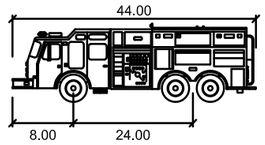
		feet
Width	:	8.50
Track	:	8.50
Lock to Lock Time	:	6.0
Steering Angle	:	37.8





Aerial Fire Truck

		feet
Width	:	8.50
Track	:	8.50
Lock to Lock Time	:	6.0
Steering Angle	:	33.3



Pumper Fire Truck

		feet
Width	:	8.50
Track	:	8.50
Lock to Lock Time	:	6.0
Steering Angle	:	37.8